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INSTRUCTION MANUAL

SD410
REMOTE CONTROL

(MODIFIED TO MODEL SD410A)

Scientific-Atlanta
Spectral Dynamics Division

MP MASTER
MA29901

SERIAL 88

INSTRUCTION MANUAL

SD410
REMOTE CONTROL

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Spectral Dynamics Division
United States: P.O. Box 23575 • San Diego, CA 92123-0575 • (619) 268-7100 • TWX 910-335-2022

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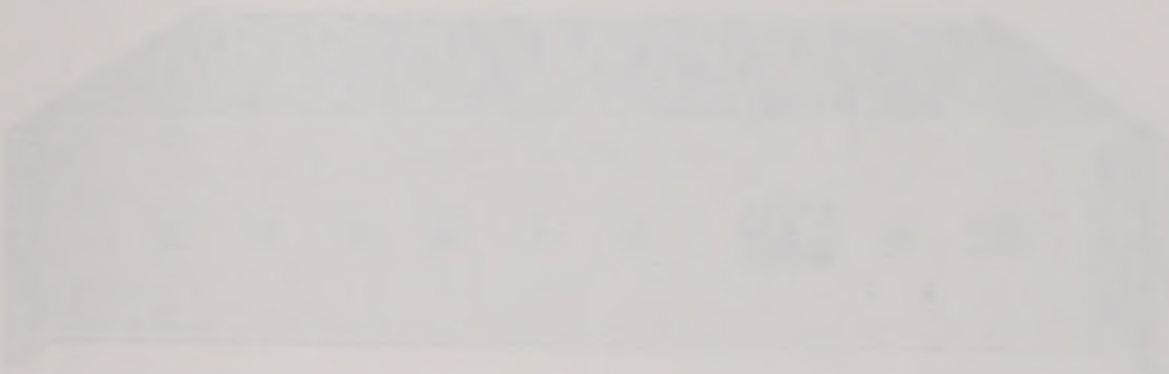
SD410 REMOTE CONTROL



DOMESTIC
SYSTEM COMPONENT
WARRANTY POLICY

All equipment manufactured by Spectral Dynamics Division as system components and all equipment made by other manufacturers and sold by Spectral Dynamics Division as system components are warranted against defects in materials and workmanship for a period of 90 days from date of delivery. We will repair or replace equipment which proves defective during the warranty period, providing the malfunction has not been caused by misuse or abnormal operating conditions.

If the malfunction or a portion thereof is determined by Spectral Dynamics Division to have been caused by misuse or abnormal operating conditions, an estimate of the cost to repair will be submitted to the purchaser for approval before beginning any repair work.

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Spectral Dynamics Division
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ADDENDUM

Model SD410A Remote Control

The Model SD410A is a modified Model SD410 Remote Control. The standard Model SD410 Instruction Manual (Document No. 21801900), together with this addendum, provides coverage for the Model SD410A.

The "A" added to the model number indicates internal modifications that are transparent to the operator and have been implemented for product improvement. Hence, the operating instructions contained in the standard Model SD410 Instruction Manual are the same for the Model SD410A.

The List of Drawings on page xi in the Table of Contents and the drawings themselves have been changed to reflect the SD410A modifications.

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A4	Control Assembly (Sh. 4)	21393200
A4	Control Schematic	21393000
A1PS1	Power Supply Schematic	21391400

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains instructions for unpacking, initial checkout, and operation of the Scientific-Atlanta's Model SD410 Remote Control Unit.

Section I contains a listing of other documentation, a brief description of the SD410, its options and accessories. Section II provides procedures for initial inspection and installation. Section III provides a detailed description of the front and rear panel. Section IV contains concept of operation. Section V contains the calibration and maintenance procedures. Section VI contains a list of replacement parts and assemblies.

1.2 DOCUMENTATION

This manual provides the information necessary to operate and service the Model SD410 Remote Control Unit.

1.3 EQUIPMENT DESCRIPTION

The Model SD410 Remote Control unit provides the control and display functions to perform as a remote master control of a programmable shaker system. Front panel controls allow the operator to select specific tests and control subsequent testing. Figure 1-1 is a block diagram of the SD410.

The SD410 may be incorporated in an Automatic Random Vibration Control System. Provisions are incorporated to allow two-way communication between the shaker station and a System Control unit. Serial communication is in RS-232-C format for distances up to 750 feet. For distances greater than 750 feet, a 1200 BAUD FSK Modem is used.

As a remote control, the SD410 allows the opeator to select a pre-defined test, initiate equalization, start and stop testing, and select either fixed or continuous equalization during testing.

1.4 REQUIRED EQUIPMENT

The Model SD410 requires inputs and outputs from the following equipment.

a. Model SD400 System Control (or other compatible System Control).

b. User supplied Chamber Control Encoder.

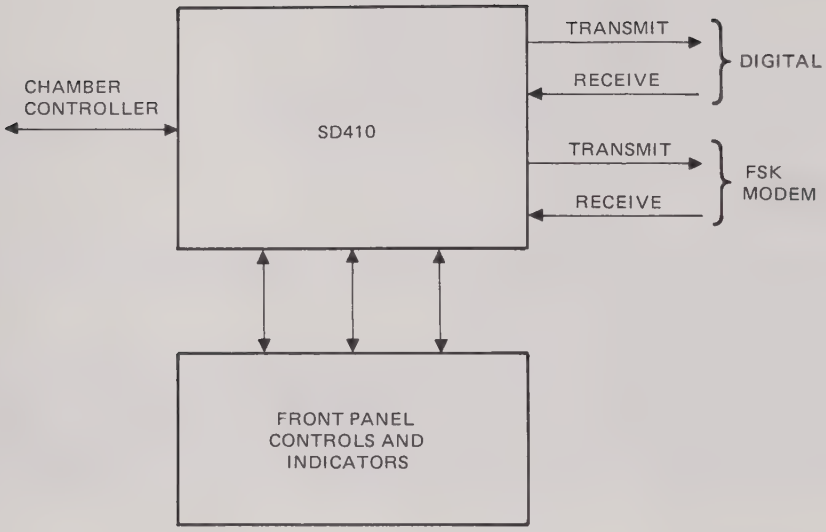


Figure 1-1. Remote Control Block Diagram

1.5 ANCILLARY EQUIPMENT

None required.

1.6 ACCESSORIES FURNISHED

The Model SD410 Accessory Kit comprises the following:

1	17250-2 (Belden) Power Cord
2	Rack Mounting Brackets
4	10-32 × 3/8″ Phillips Oval Head Screws

1.7 SPECIFICATIONS

1.7.1 Electrical Specifications

Input Impedance without terminating resistors	Standard TTL load.
Interconnect Cable lengths	
SD410 to System Control or telephone conn box	Twisted pair wires should not exceed 750 feet.
SD410 to Chamber Control	Should not exceed 25 feet.
Interrupt Strobe	100 usec negative pulse (standard TTL levels).

1.7.2 Input Power Requirements

Switch Selectable	105-125 VAC at 50-400 Hz 210-250 VAC at 50-400 Hz
Power	30 Watts
Fuses	2A Slo-Blo for 115 VAC 1A Slo-Blo for 230 VAC

1.7.3 Mechanical Specifications

Height	13.3 cm (5.25 inches)
Width (Std Rack Panel)	43.2 cm (17 inches)
Depth (W/O Connectors)	49.5 cm (19.5 inches)
Weight	9.5 kg (21 pounds)

1.8 OPTIONS AVAILABLE

Below are listed the standard options that are available for the Model SD410. Questions on options and specific application problems should be directed to the Spectral Dynamics Division, Applications Department.

1.8.1 Model SD410

The Model SD410 Remote Control Unit incorporates the following standard features:

a. Logic to read and drive the front panel switches and indicators.

b. Asynchronous duplex communication with the System Control Unit, either directly via twisted pair, or via standard telephone lines.

c. Access to the System Control Timer for accurate test timing.

1.8.2 Model SD410-1

The -1 option is installed in the factory. It is soldered directly to the Remote I/F assembly and requires no wiring changes. The modem provides a 0 to 1200 baud, full-duplex link to the System Control Unit. When the -1 option is installed in the SD410, the corresponding System Control Unit must be configured with the appropriate options.

1.8.3 Model SD410-2

The -2 option consists of an integrated circuit and an 4.7K ohm DIP resistor package. The modification allows the SD410 to interface with a Chamber Controller using Negative True logic.

SECTION II

INSTALLATION

2.1 INTRODUCTION

This section contains procedures for initial inspection, installation, preparation for use, handling shipping damage or in-warranty repairs, and repacking the instrument for shipment.

2.2 INITIAL INSPECTION

2.2.1 Unpacking

Carefully remove the instrument from the shipping container to avoid damage to the front panel controls,and displays or the rear panel connectors. The accessory kit may be packaged separately. Check the items received against the packing slips. Save the shipping container, and packing materials until the instrument has been inspected and operationally checked.

Check the hardware to determine if any assemblies or screws have been loosened during shipment. Tighten as required. Inspect for dust of foreign material which may impair electrical contact when cable connections are made. Vacuum to remove any loose particles.

2.2.2 Inspection for Physical Damage

Inspect all panels for dents, chipped paint or scratches. Check for bent/broken switches or connectors. Photos of damage are recommended to substantiate subsequent claims.

2.2.3 Packing for Reshipment

If the instrument is to be reshipped, use the original shipping container and packing materials. If they are not available, the following materials are recommended.

a. A double-wall carton, test strength 350 pounds. The carton should be large enough to enclose the instrument when surrounded by the packing materials listed in b, c, and d.

b. Heavy paper cardboard covering all instrument surfaces.

c. Polyurethane, bubble pack, or corrugated paperboard between instrument projections and the carton inner wall.

d. At least four inches of shock-absorbing material such as extra-firm polyurethane.

2.2.4 Warranty or Damage Claims

If the instrument was physically damaged in shipment or does not operate as specified, immediately notify the carrier and the nearest Scientific-Atlanta Sales/Service office or representative. (Scientific-Atlanta offices and representatives are listed in the rear of this manual.) The local office will arrange for repair or replacement of the instrument.

NOTE

Please be sure to attach a card to the instrument showing your company's name, address, and telephone number. Include a short description of the damage or problem.

2.3 SAFETY PRECAUTIONS

The SD410 presents no hazards to operators if operated according to the instructions in this manual. Read the following safety precautions before applying power to the instrument.

2.3.1 Explosion Hazards

Do not operate the instrument in any area where flammable vapors may be present. Operating any ac-line powered instrument in such an environment can cause an explosion.

2.3.2 Shock/Burn Hazards

The three-conductor ac line cord provided with the instrument is intended to ground the chassis to help prevent shock and injury to personnel. In most cases, the national and local electrical codes require three-conductor ac outlets that connect the third wire of the line cord to power ground.

a. If only two-wire ac outlets are available, install a three-wire to two-wire adapter between the instrument and the outlet.

b. If an adapter is used, connect its third wire lead to ground at the power outlet before connecting the instrument.

c. Test for ground continuity between the equipment chassis and adjacent equipment, or metal plumbing to ensure the operator cannot become a conductor between power ground and building ground.

The instrument covers should be removed ONLY by qualified personnel. Dangerously high voltage is present inside the instrument when the power is connected. Never remove the cover when the ac line cord is connected to the ac power outlet.

2.4 PREPARATION FOR USE

2.4.1 Power Requirements

The Model SD410 Remote Control Unit is designed to operate from either 105-125 VAC or 230-250 VAC. Before connecting the equipment to the power line:

a. Set the 115/230 switches on the rear panel to read the appropriate voltage.

b. Install the correct line fuse as shown on the rear panel FUSE DATA plate.

2.4.2 Mounting

The SD410 Remote Control Unit is normally installed in a 19-inch equipment rack. Mounting brackets are included in the accessory kit provided.

2.4.3 Cooling

The SD410 Remote Control Unit uses convection cooling. Avoid any object blocking the normal air flow through the chassis. Restricting the air flow could result in damage due to overheating.

2.4.4 Equipment Interconnections

Figure 2-1 is a basic interconnect diagram showing the Model SD410 integrated into an SD1200 Digital Random Vibration Control System.

Figure 2-2 is a diagram of the interconnect required for an SD410 connected in a standard configuration with a chamber controller.

Figure 2-3 is a diagram of the interconnect required for an SD410 connected in the modem configuration with a chamber controller.

When an SD400 and SD410 are interconnected using telephone lines, Figure 2-4 applies.

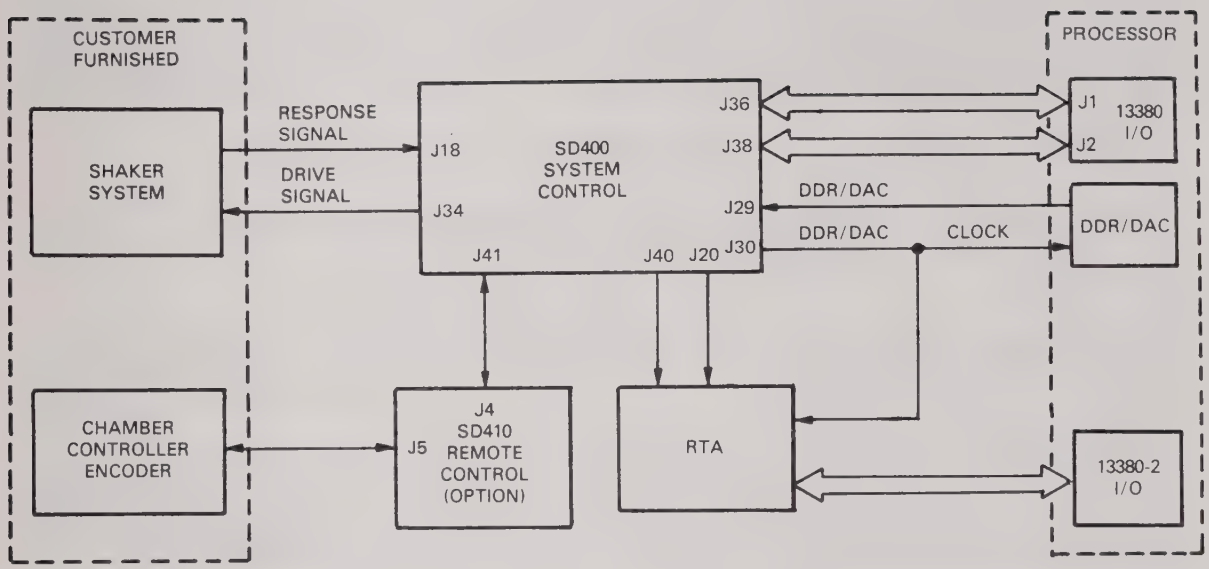


Figure 2-1. Interconnect Diagram of an SD410

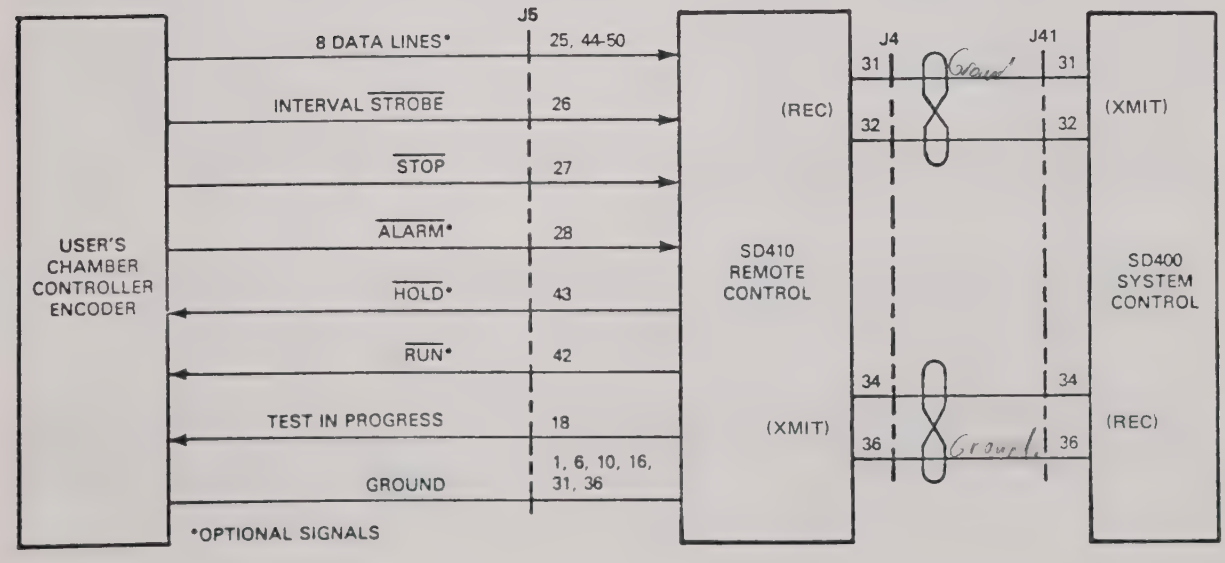


Figure 2-2. SD410 Remote Control and Chamber Controller Interconnections

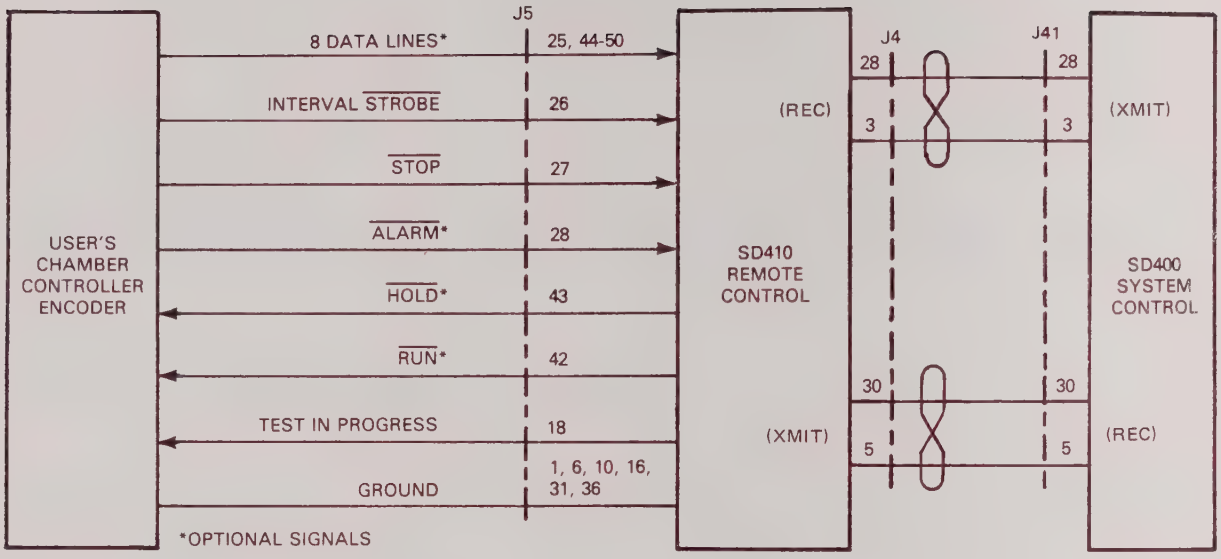


Figure 2-3. SD410 Remote Control (Modem Option) and Chamber Controller Interconnections

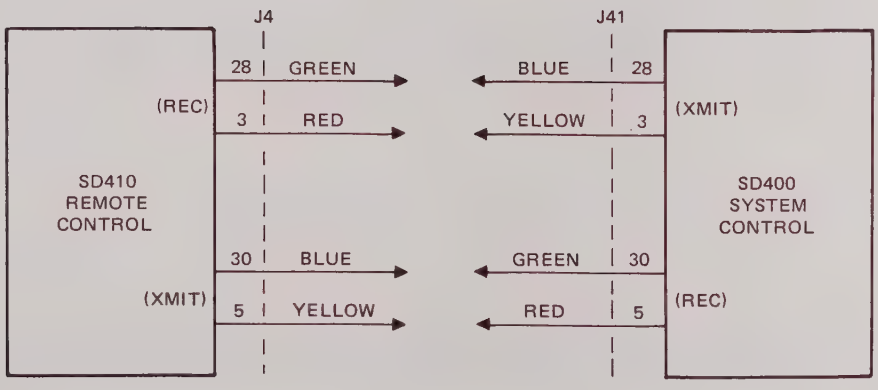


Figure 2-4. Interfacing an SD410 to SD400, Using Telephone Lines

SECTION III

OPERATION

3.1 INTRODUCTION

This section describes the functions of the front and rear panel, connectors, jumpers, and switch settings of the SD410 Remote Control. It also contains information on startup and operating procedures.

3.2 FRONT PANEL DESCRIPTION

The SD410 front panel configuration is shown in Figure 3-1.

Figure 3-1. Model SD410 Front Panel

A random vibration system can be controlled from the front panel of the SD410 Remote Control unit. The following paragraphs describe the functions performed by each front panel control and indicator.

ACTIVE LED Indicators

With the rear panel INT/EXT switch (S1) in the INT (internal) position, the ACTIVE LED indicators illuminate, when the SD410 is connected to the random vibration system. They indicate that the switches on the front-panel are active. In the EXT position, a chamber controller is enabled.

TEST NO. Display

Displays the current test number selected from the System Control unit or the SD410.

ENTER Pushbutton

A LED pushbutton that illuminates when pressed. It enters the test number selected by the SD410. The System Control unit REMOTE LED illuminates when a test number is selected from the SD410.

INT Indicator

A LED indicator that illuminates when the Control Switch (S-1) on the rear panel is in the INT position.

EXT Indicator

A LED indicator that illuminates when the Control Switch (S-1) on the rear-panel is in the EXT position.

SELECT Switch

A two decade minilever switch that selects the desired test number. Selecting and entering number 00 will initialize the 410 and the TEST NO. indicator will display the current test number from the System Control unit.

STOP Pushbutton/Indicator

A LED pushbutton that illuminates when pushed to stop a test. The STOP pushbutton is always active.

COMM FAULT Indicator

A LED that illuminates when a hardware error occurs. A master clear toggle (S2) on the rear panel usually clears this condition.

START Pushbutton/Indicator

A LED pushbutton that illuminates when pushed to start a test.

EQUALIZE Pushbutton/Indicator

If the System Control unit is in the MANUAL equalize mode, it will switch to the AUTO equalize mode when the EQUALIZE pushbutton is pushed. If the System Control unit was already in the AUTO equalize mode, no change will take place. Pushing the EQUALIZE button while test is running will return the test to the highest pretest level into the MANUAL mode.

UPDATE Pushbutton/Indicator

A LED pushbutton that puts the System Control unit in the UPDATE (closed-loop) mode of operation.

FIXED Pushbutton/Indicator

A LED pushbutton that puts the System Control unit in the FIXED (open-loop) mode of operation.

3.3 REAR PANEL DESCRIPTION

The SD410 Rear Panel Configuration is shown in Figure 3-2.

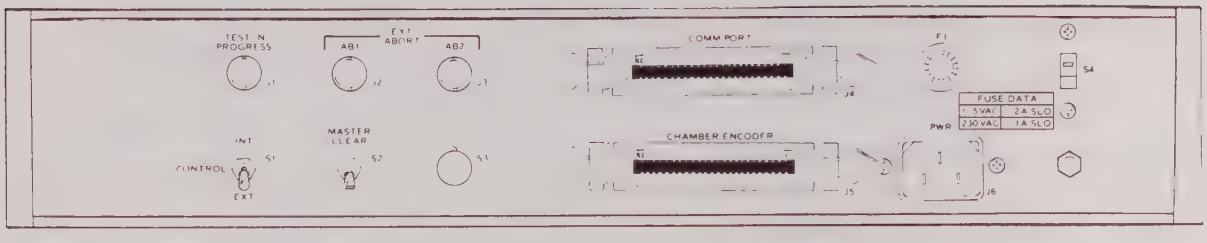


Figure 3-2. Model SD410 Rear Panel

TEST IN PROGRESS BNC Connector (J1)

A TTL level (positive true) signal. The signal is initiated 0.5 second before going to full test level and is held until the system exits from the full test condition.

EXT ABORT BNC Connectors AB1 (J2) and AB2 (J3)

A relay closure (signal to ground) input used to stop the test. The System Control unit STOP CODE display will display code 6 or 7 for AB1 or AB2, respectively.

COMM PORT Multipin Connector (J4)

Transmit and receive twisted pairs used to communicate in serial form with the System Control unit. Table 3-8 is a list of the assigned pins.

CHAMBER ENCODER Multipin Connector (J5)

Used to transmit signals between the Chamber Encoder and the SD410 Remote Control Unit. Table 3-9 is a list of the assigned pins.

PWR Receptacle (J6)

Accepts 3-wire plug for applying 115/230 Vac, primary input power.

F1 (Fuseholder)

Accepts a 3AG Slo-Blo fuse. The rating of F1 is 2 amps for 115 Vac and 1 amp for 230 Vac operation.

S4 (115/230 Vac Switch)

Provides switching of primary input power circuits for either 115 Vac or 230 Vac operation. Proper input voltage to be applied is shown in switch window.

CONTROL Switch (INT/EXT) (S1)

In the EXT (external) position, only the SD410 STOP pushbutton is enabled. All SD410 controls are enabled in the INT (internal) position and the front panel ACTIVE LEDS are ON.

MASTER CLEAR Switch (S2)

Used to reset the SD410 logic when a COMM FAULT occurs.

3.4 INITIAL POWER APPLICATION

3.4.1 Preliminary Power Checks

If the SD410 is rack mounted, a 1-1/4" clearance, above and below the unit is required to provide convection cooling.

Plastic feet provided with the instrument should be installed on the bottom of the cabinet whenever the unit is not rack mounted. They replace the four screws that secure the bottom cover, and provide sufficient clearance for cooling.

The operator should check that the airflow through the top and bottom covers is not restricted.

3.4.2 Equipment Turn On

The system should be in STOP mode prior to connecting the SD410 as the remote station. The following procedure should be followed when applying power to the SD410.

a. Place the System Control Unit that the SD410 is to be connected to in the STOP mode.

b. Connect BNC cables Test in Progress (J1), AB1 (J2) and AB2 (J3) to the connectors on the rear panel of the SD410.

c. Connect the COMM PORT (J4) and CHAMBER ENCODER (J5) connectors to the rear panel.

d. Check the value of the FUSE (F1) on the rear panel. Table 3-1 provides standard fuse information for the instrument.

Table 3-1. Fuse Data

Input Voltage	Fuse
115 Vac	2A SLO
230 Vac	1A SLO

e. Set switch S-4 for the proper line voltage (115/230).

f. There is no POWER ON/OFF switch on the SD410. Apply power to the unit by connecting the power cord supplied with the system to the POWER connector (J6) on the rear panel.

g. Wait about 15 seconds, and then toggle the MASTER CLEAR switch on the rear panel to MASTER CLEAR. This will reset the unit and prepare it for operation.

3.5 INITIAL SETUP AND ADJUSTMENT

3.5.1 External Abort/Chamber Command Switch (A1A4-U46)

The External Abort/Chamber Command switch is a six-position DIP switch located at A1A4-U46. The switches are used to configure the inputs as Positive True or Negative True. They are set at the factory for negative true. Table 3-2 is a list of the switches and the inputs they control. It also contains a list of the normal factory settings. Table 4-5 and 4-6 give a detailed description of the switches and the functions.

Table 3-2. Switch A1A4-U46

U46	Input	Factory Switch Setting
Switch 1	AB1 (EXT ABORT 1)	Closed
Switch 2	AB2 (EXT ABORT 2)	Closed
Switch 3	CHAMBER STOP	Closed
Switch 4	CHAMBER STB	Closed
Switch 5	SPARE	Closed

3.5.2 BAUD Rate Select Switches (A1A3-U45, A1A3-U56)

The BAUD Rate Select switches are chosen to match the BAUD Rate selected for the System Control Unit, Remote Interface Assembly (A1A2) UART. Table 3-3 is a list of the switch positions normally set at the factory. Table 4-2 is a detailed description of the switches and the functions they perform.

Table 3-3. BAUD Rate Selection

Switch	Frequency Selected	BAUD Rate Selected
A1A3-U45-4	307,200 Hz	XX
A1A3-U56-4	19,200 Hz	1200 BAUD

3.5.3 UART Setup Switch (A1A3-U2)

The UART Setup Switch (A1A3-U2) is a 6-position DIP switch. The switch is used to match the data format selected in the System Control unit. Table 3-4 is a list of the switch positions normally set at the factory. Table 4-1 is a detailed description of the switches and the functions they perform.

Table 3-4. Switch A1A3-U2

U2	Remote	MODEM
Switch 1	Closed	Open
Switch 2	Closed	Closed
Switch 3	Closed	Closed
Switch 4	Open	Open
Switch 5	Open	Open
Switch 6	Closed	Closed

3.5.4 Jumper Selection

Tables 3-5, 3-6, and 3-7 are listes of the jumpers hardwired to the A1A3, A1A4, and A2A1.

Table 3-5. Jumpers, A1A3

Jumper	Function
E1	−12 Vdc
E2	+12 Vdc
E3	GROUND
E4	GROUND
E5	+5 Vdc
E6	GROUND

Table 3-6. Jumpers, A1A4

Jumper	Function
E1	MASTER CLEAR switch
E2	Ground - From MASTER CLEAR switch
E3	AB2 - From rear panel BNC
E4	Ground - From AB2 BNC
E5	AB1 - From rear panel BNC
E6	Ground - From AB1 BNC
E7	EXT - From rear panel CONTROL switch
E8	TEST IN PROGRESS - From rear panel BNC
E9	GROUND - From TEST IN PROGRESS BNC
E10	INT - From rear panel CONTROL switch
E11	GROUND
E12	+5 Vdc
E13	+5 Vdc
E14	GROUND
E15	GROUND
E16-E18	RD19
E17-E18	RD19

Table 3-7. Jumpers, A2A1

Jumpers	Function
E1	SELECT MSD 8
E2	SELECT MSD 4
E3	SELECT MSD 2
E4	SELECT MSD 1
E5	SELECT LSD 8
E6	SELECT LSD 4
E7	SELECT LSD 2
E8	SELECT LSD 1
E9	GROUND - SELECT SWITCH

INTERNAL CABLING

Figure 3-3 is a block diagram of the internal cabling of the SD410. Table 3-8 and 3-9 list the pin assignments for the rear panel connectors.

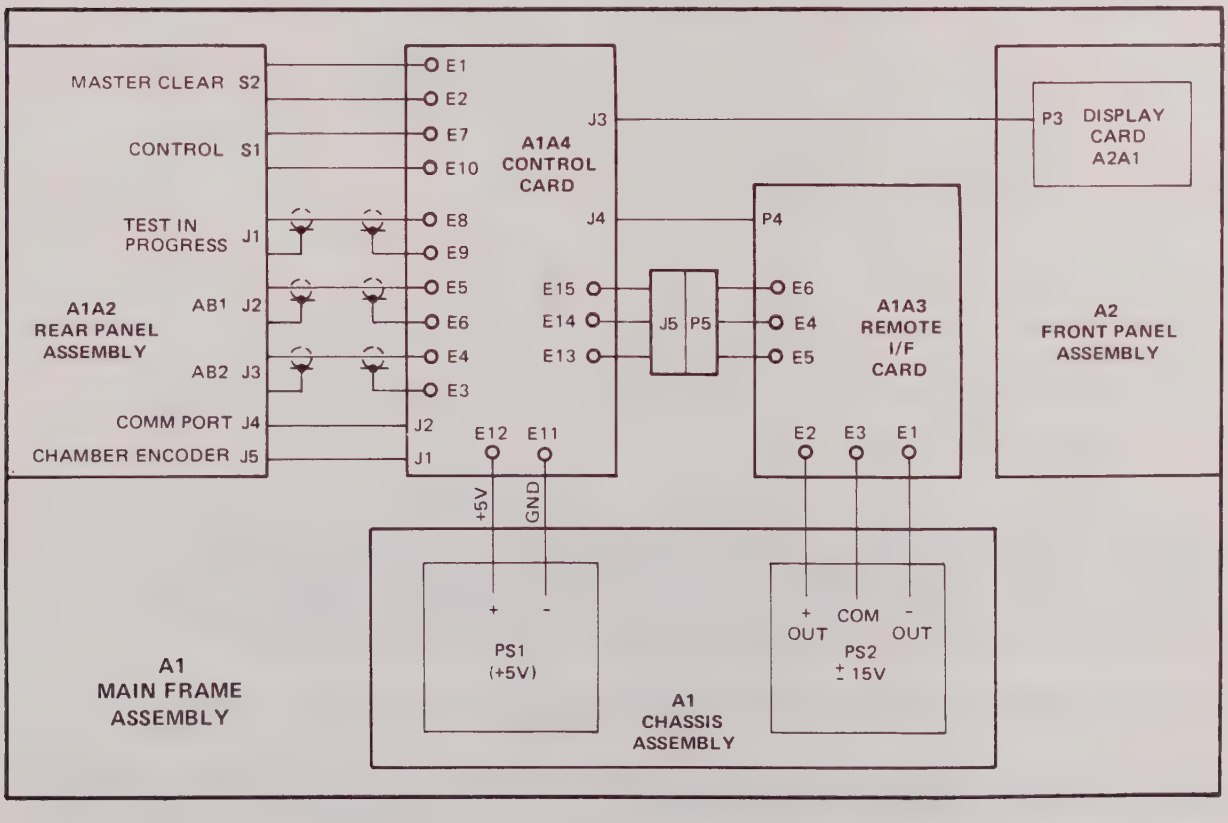


Figure 3-3. Block Diagram, Internal Cabling, SD410

Table 3-8. Comm Port Connector (J4), Rear Panel (A1A2)

Pin No.	Designation	Pin No.	Designation
1		26	
2		27	
3	XMIT -1 (MODEM OPTION)	28	XMIT -2 (MODEM OPTION)
4		29	
5	REC PAIR -1 (MODEM OPTION)	30	REC -2 (MODEM OPTION)
6		31	XMIT -1 (STANDARD REMOTE)
7		32	XMIT -2 (STANDARD REMOTE)
8		33	
9		34	REC -1 (STANDARD REMOTE)
10		35	
11		36	REC -2 (STANDARD REMOTE)
12		37	
13		38	
14		39	
15		40	
16		41	
17		42	
18		43	
19		44	
20		45	
21		46	
22		47	
23		48	
24		49	
25		50	

3.6 OPERATION

3.6.1 Operating Procedure

The SD410 controls the test by controlling the System Control unit, via twisted pairs or telephone MODEM from a remote location. The SD410 can also be used to interface with a Chamber Controller to select a test and control the System Control unit. When a Chamber Controller is controlling the system, there is no operating procedure for the SD410. The following paragraphs describe how to operate an automatic random vibration control system from the SD410 Remote Control Unit.

a. From the rear panel select INT (internal) control with switch S1.

b. Connect the SD410 to the system as shown in Figure 2-1. The ACTIVE LEDS will illuminate when the random program is loaded.

c. Select the desired test number with the SELECT switches. A setting of 00 will cause the SD410 to select and display the current System Control unit test number.

Table 3-9. Chamber Encoder Connector (J5), Rear Panel (A1A2)

Pin No.	Designation	Pin No.	Designation
1	GROUND	26	STROBE
2		27	STOP
3		28	ALARM
4		29	
5		30	
6	GROUND	31	GROUND
7		32	
8		33	
9		34	
10		35	
11	GROUND	36	GROUND
12		37	
13		38	
14		39	
15		40	
16		41	
17	GROUND	42	RUN
18	TEST IN PROGRESS	43	HOLD
19		44	AUX 4
20		45	AUX 3
21		46	AUX 2
22		47	AUX 1 (LSB)
23		48	AUX 5
24		49	AUX 6
25	AUX 8 (MSB)	50	AUX 7

d. Press the ENTER pushbutton to enter that test. The test number will appear in the TEST NO. indicator.

e. Push the start button to begin the test.

f. Push the EQUALIZE button to assure that the System Control unit is in the AUTO equalize mode. The system will equalize at each pretest level and automatically advance to the next highest pretest level until it reaches the full test level.

g. Press either the UPDATE (closed-loop operation) or FIXED (open-loop operation) pushbutton to select the desired full test mode of operation.

h. If the front panel COMM FAULT LED Lights (test will stop), toggle the rear panel MASTER CLEAR to reset the SD410 control logic.

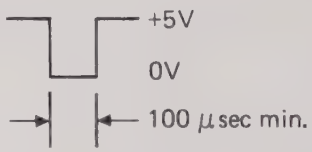
3.6.2 Operating Procedure Using Chamber Controller

When remote control of a system is from an environmental chamber, the user must supply a chamber controller encoder. The following outline describes the required format for the signals between the Chamber Controller and the SD410 Remote Control Unit. Figure 2-2 and Tables 3-8 and 3-9 show the interconnections and pin assignments for the SD410 Remote Control Unit.

a. Chamber Controller to SD410 Control Signals

1. Eight data lines — AUX 1 (LSB) through AUX 8 (MSB) are used to identify test numbers or other data. Signal levels are TTL (positive true) and transfer is parallel. Standard coding for the lines is BCD (00-99).

2. Interval Strobe — Strobe is negative true and data lines are valid (read) during this period.



This pulse is generated when the Chamber Controller START button is pressed and when chamber conditions change to a new environmental condition. The control system reacts as follows:

a) If the random vibration control system is in the STOP state and the test has not been run before. The eight AUX lines are interpreted as a test number. The new test begins at the lowest pretest level and equalizes at each level until it reaches the full test level.

b) If the random vibration control system is running a test and the ENTER button is pressed, the eight AUX lines are read and the new test profile is loaded from the disk into the computer memory. The current test level is reduced to its lowest pretest level. The system then switches to the new test profile and equalizes at each pretest level.

c) If the test was stopped with a manual or chamber STOP, the chamber strobe and eight AUX lines are read when ENTER is pressed. If the test number did not change, the system goes from STOP to full test without going through equalizations.

3. Stop Line — A level 0, Neg true (0V to 0.8V). Used to stop the vibration control system. The system is restartable at full test level.

4. Alarm Line — A Level 0, Neg true (0V to 0.8V). Used to notify the vibration system of a problem in the chamber system (Can be used for data logging.) The system is not restartable to full test.

b. From SD410 to Chamber Controller Control Signals:

1. Hold — A level 0, Neg true (0V to 0.8V). Used to stop chamber timer until vibration control system is at full test level.

2. Run — A level 0, Neg true (0V to 0.8V). Used to release hold condition and start chamber timer.

3. Test In Progress — A TTL level (positive true) initiated 0.5 seconds before going to full level and held until the system exists from the full test condition.

SECTION IV

CONCEPT AND THEORY OF OPERATION

4.1 INTRODUCTION

This section contains a brief concept of operation, followed by a detailed functional level, theory of operation.

4.2 GENERAL CONCEPT

The SD410 consists of three circuit boards, the front-panel assembly and two dc power supplies mounted in a 19" × 3-1/2" mainframe. The mainframe fits a standard rack mount.

The SD410 gives the operator the option to control a vibration test from a remote station location up to 750 feet from the System Control Unit. Communication with the parent control unit is over twisted pair using serial data transfer.

The -1 option provides the addition of an FSK modem that can be interfaced with a properly configured System Control Unit to communicate over telephone lines or twisted pair, at distances greater than 750 feet.

In addition the SD410 has the capability to interface with several Chamber Controllers. Connector J5 (Chamber Encoder) is wired at the factory on all SD410 Remote Controls. Appendix A is an SD410 configuration chart showing the different chamber controller configurations for the SD410.

The SD410 front and rear-panel controls are discussed in Section III.

Five basic functions can be performed by the Remote Control.

a. Select a test number.

b. Start and stop a test.

c. Select continuous equalization or fixed drive signal operation.

d. Display the test number in use and indicate the basic test status.

e. Select local (front-panel) or external (chamber controller) operation.

The SD410 allows the user to control the vibration system right from the shaker head, if desired, or turn control of the system and the environmental chamber over to a chamber controller connected to the Chamber Encoder Port (J5).

One major advantage of controlling the entire test sequence from the exciter is that it allows an on-site operator to shut down the test at the first visual or accoustical indication of a bad test.

Figure 4-1 is an overall block diagram of the SD410. It includes the modem option that is installed in -1 Remote Controls.

4.3 POWER SUPPLY ASSEMBLY (A1A1)

A +5 Vdc power supply (PS1), and a ±15 Vdc power supply (PS2) are located at the front of the chassis mainframe. They supply all the power required by the units.

4.4 REAR PANEL ASSEMBLY (A1A2)

The rear panel assembly contains all the connectors required to interface the SD410. Section 3.3 gives a description of each connector and their function.

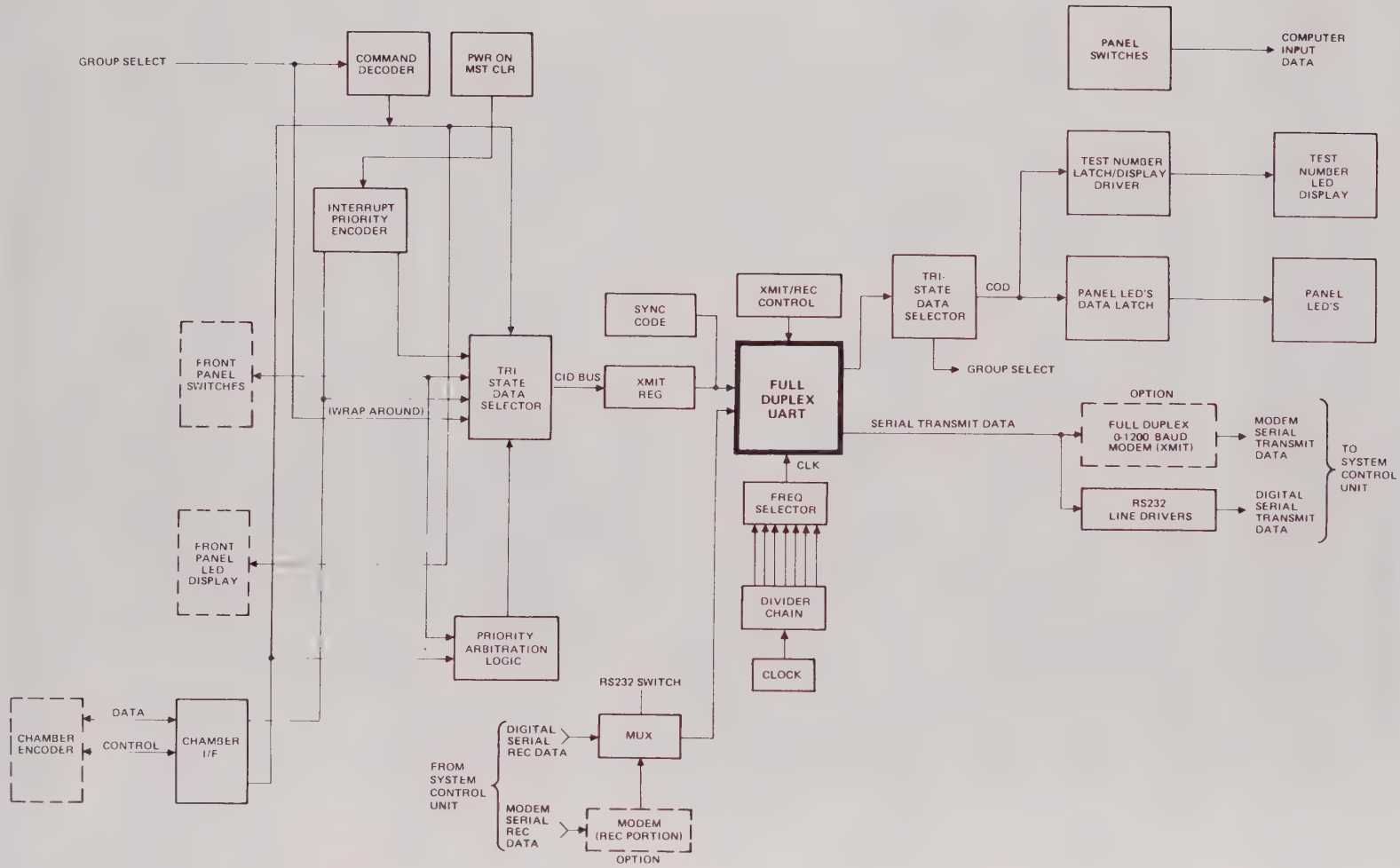


Figure 4-1. Overall Block Diagram SD410

4.5 REMOTE INTERFACE ASSEMBLY (A1A3)

The Remote Interface provides a serial digital data link to the parent System Control unit. Information is transferred by either serial digital data lines (1200 Baud, Odd Parity, 8 Bit Word, 1 Stop Bit) or through an FSK modem interface. Figure 4-2 is a block diagram of the A1A3 with the FSK modem interface.

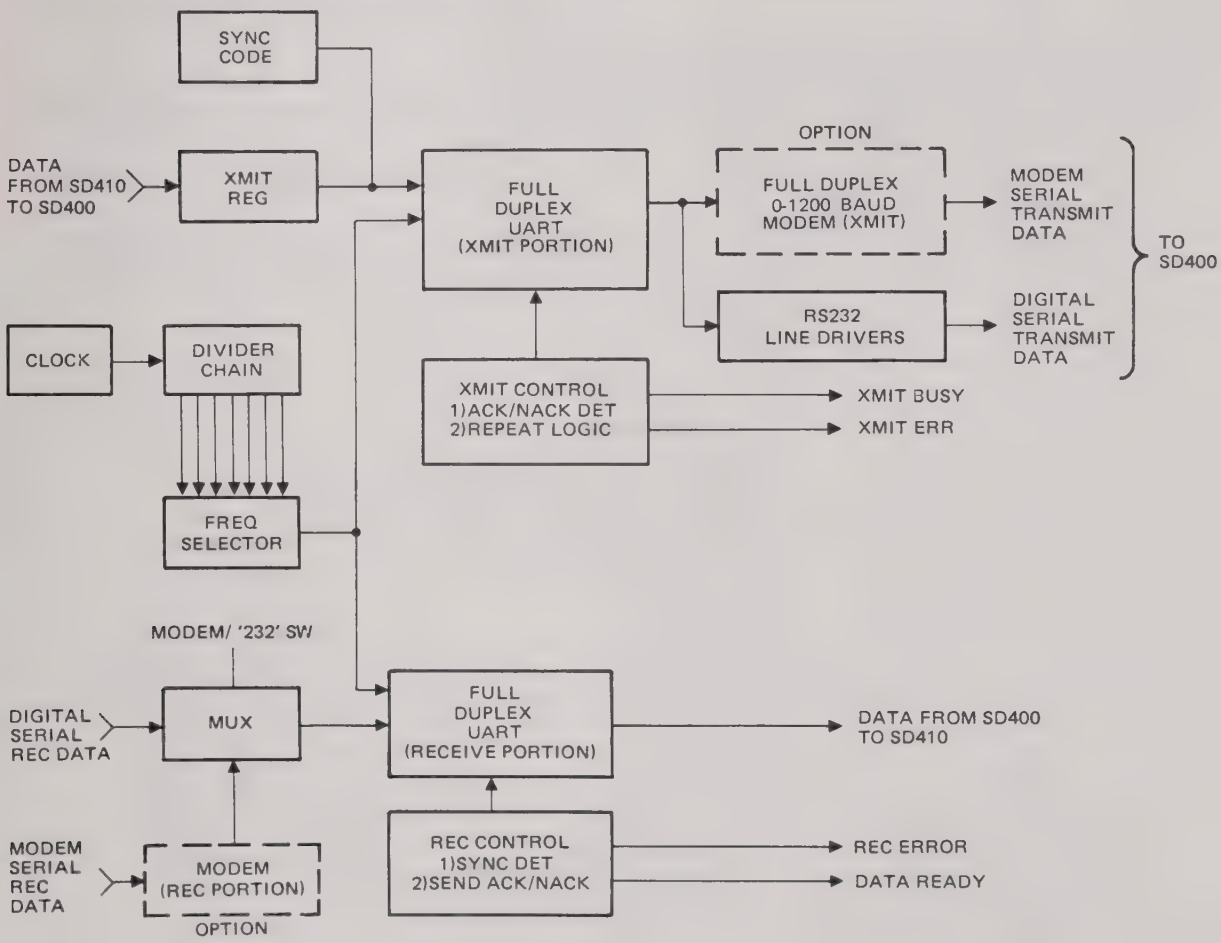


Figure 4-2. A1A3 Block Diagram

4.5.1 Transmitter

A Universal Asynchronous Receiver Transmitter (UART) is the central component of the assembly. It receives eight bits of parallel data input from the COD bus and converts it to a serial output data format selected by the switch positions of DIP switch A1A3-U2. Table 4-1 shows the switch functions assigned to A1A3-U2.

Transmitter Serial Output (XMIT DATA) of the UART is output to the rear panel through an RS-232-C Line Driver as XMIT DIG DATA. When the modem option is supplied, XMIT DATA is buffered and transmitted as FSK data.

Table 4-1. A1A3-U2 Switch Assignment

Switch Position	UART Pin Number	Function
1	—	MODE OF OPERATION Open - SERIAL Closed - FSK MODEM
2	NPB (35)	NO PARITY BIT Open - NO PARITY BITS Closed - 1 PARITY BIT
3	POE (39)	PARITY ODD/EVEN Open - EVEN PARITY Closed - ODD PARITY
4 5	NDB2 (37) NDB1 (38)	NDB2 / NDB1 / No. of Data Bits Closed / Closed / 5 Closed / Open / 6 Open / Closed / 7 Open / Open / 8
6	NSB (36)	NUMBER OF STOP BITS Open - 2 STOP BITS Closed - 1 STOP BIT

4.5.2 Receiver

The serial receive data is accepted by an RS-232-C line driver and multiplexed with REC DIG DATA. The output of the multiplexer is determined by "0" DIGITAL LINK (U2 position 1). A closed switch selects Modem Receive data while an open switch selects Serial Digital Receive data. The selected receive data is then routed to the RSI input of the UART.

The receive data is converted to 8 bits of parallel data and transferred to either the LSB or MSB of a 16 bit register, by LD LSBY and LD MSBY. The register transfers the contents to the COD bus.

4.5.3 Clock

The clock consists of a 2.4576 MHz crystal oscillator. The output of the crystal oscillator is divided down to create a DIP switch selectable BAUD Rate for the UART. It also generates an output data strobe.

NOTE

The clock frequency generated is always 16 times the actual BAUD Rate of the serial output.

Selection of the DIP switches U45 and U56 determine the BAUD Rate. Table 4-2 assigns the functions of U45 and U56.

Table 4-2. Switch Selection U45 and U56

Switch U45	Switch U56	BAUD Rate	Frequency (16 × the Desired BAUD Rate ±30 Hz)
1	1	76,800	1,228,800 Hz
1	2	38,400	614,400 Hz
1	3	19,200	307,200 Hz
1	4	9,600	153,600 Hz
1	5	4,800	76,800 Hz
1	6	2,400	38,400 Hz
1	7	1,200	19,200 Hz
1	8	600	9,600 Hz
2	1	38,400	614,400 Hz
2	2	19,200	307,200 Hz
2	3	9,600	153,600 Hz
2	4	4,800	76,800 Hz
2	5	2,400	38,400 Hz
2	6	1,200	19,200 Hz
2	7	600	9,600 Hz
2	8	300	4,800 Hz
3	1	19,200	307,301 Hz
3	2	9,600	153,600 Hz
3	3	4,800	76,800 Hz
3	4	2,400	38,400 Hz
3	5	1,200	19,200 Hz
3	6	600	9,600 Hz
3	7	300	4,800 Hz
3	8	150	2,400 Hz
4	1	9,600	153,600 Hz
4	2	4,800	76,800 Hz
4	3	2,400	38,400 Hz
4	4	1,200	19,200 Hz
4	5	600	9,600 Hz
4	6	300	4,800 Hz
4	7	150	2,400 Hz
4	8	75	1,200 Hz

4.5.4 Transmitter and Receiver Control

A reasonably complex control and timing circuit is required by the UART and the Remote Interface Circuit. Comparisons are made of the transmit and receive data and any errors detected are flagged. The LD DATA command is controlled externally of the UART by two D flip flops. LD UART is controlled by INHIBIT and STB3 lines.

R/T CLOCK is generated by the UART and used to synchronize SEL and CLR commands. RE1 through RE4 are compared with COD1 through COD4 and clocked by LD UART and LD DATA to generate the REC ERROR and XMIT ERROR signals.

DATA READY output is clocked by XMIT DATA and enabled by REC ERROR and LD MSBY.

4.6 CONTROL ASSEMBLY (A1A4)

The Control assembly is the junction where the front-panel control lines and the system interrupt structure interface. Each of the switches on the front-panel and rear-panel is handled on a priority basis determined by the hardware on the Control assembly. Other circuits provide a means of decoding commands from the system processor.

The Chamber Control logic is for Chamber Controllers with positive true logic signals. Chamber Controllers using negative true logic signals require the -2 modification to be performed at the factory prior to shipping.

The Control assembly also contains circuitry used with the MASTER CLR and CONTROL switches on the rear-panel. Figure 4-3 is a block diagram of the Control assembly.

4.6.1 Command Decoder

The Command Decoder uses the GR SEL bits input from the System Control Unit, in conjunction with the REMOTE CMD to decode command logic from the system processor. A 1 of 8 decoder using inputs of GR SEL 4, 5, and 6 is enabled when REMOTE CMD is high. The output of the encoder is used to enable one of two 1 of 16 decoders. The first of the 1 of 16 decoders is the WRITE CMD Decoder, the second is the READ CMD Decoder.

Table 4-3 is a list of the commands that can be decoded by the SD410. Appendix A is a detailed list of the codes and the functions that they perform.

Table 4-3. List of Command Codes

WRITE Commands	READ Commands
WR0 TEST NO.	RD16 READ SELECT SWITCH
WR1 PANEL DISPLAY	RD17 READ PANEL DISPLAY
WR2 RESET CONTROL	RD18 READ CHAMBER CONTROL WORD
WR3 GENERATE "A" INT	RD19 READ THERM AUX (1-8)
WR4 NUMBER OF TRANSMIT TRIES	RD20 READ THERM STATUS
WR5 WRAP AROUND	RD21 READ INTERVAL COUNT
WR6 CHAMBER CONTROL WORD	RD22 READ UNIT STATUS
WR7 LOAD INTERVAL COUNTER	

When DATA READY is present with REMOTE CMD the WRITE Decoder outputs the appropriate command present on the GRP SEL lines. To perform a READ function, CIG is required along with REMOTE CMD.

4.6.2 Priority Encoder

Each interrupt command line from the front-panel, rear-panel, and internal control requirements of the SD410 is encoded to form a two byte output code. The coded output is placed on the CID Bus. Table 4-4 is a list of the interrupt priority codes as they appear on the CID Bus for input to the system processor.

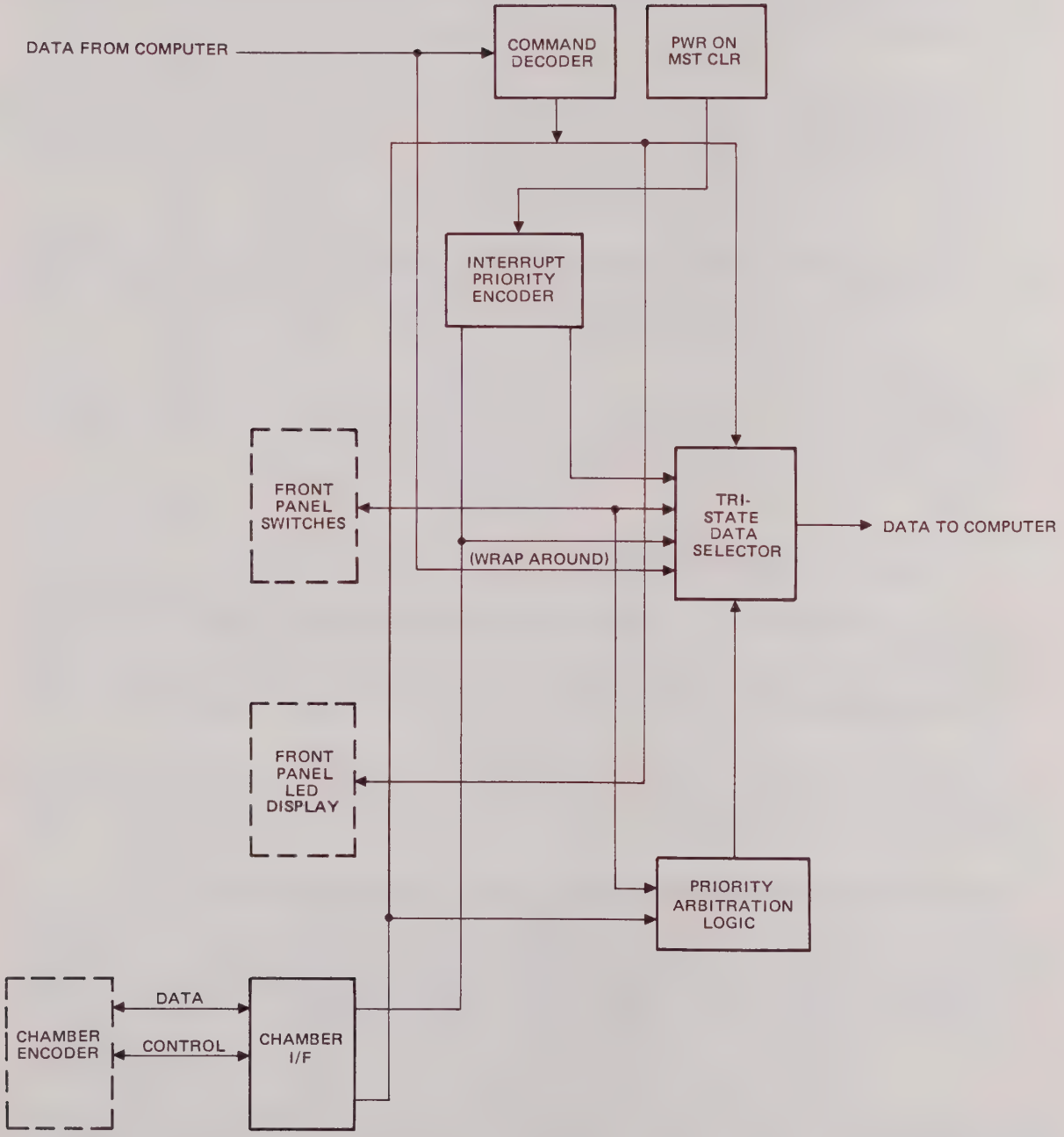


Figure 4-3. A1A4 Block Diagram

Table 4-4. Priority Encoder Output

Encoder #1	Type Interrupt	CID Bus 7	6	5	4	3	2	1	0	S-1 INT	S-1 EXT
0 GENERATE "A" INT	A	0	0	0	X	1	0	0	0	08	18
1	A									09	19
2	A									0A	1A
3 CHAMBER ALARM	A	0	0	0	X	1	0	1	1	0B	1B
4 CHAMBER STOP	A	0	0	0	X	1	1	0	0	0C	1C
5 AB2	A	0	0	0	X	1	1	0	1	0D	1D
6 AB1	A	0	0	0	X	1	1	1	0	0E	1E
7 STOP	A	0	0	0	X	1	1	1	1	0F	1F
Encoder #2		**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**		
0	B									00	10
1	B									01	11
2 CHAMBER STB	B	0	0	0	X	0	0	1	0	02	12
3 ENTER	B	0	0	0	X	0	0	1	1	03	13
4 START	B	0	0	0	X	0	1	0	0	04	14
5 EQUALIZE	B	0	0	0	X	0	1	0	1	05	15
6 FIXED	B	0	0	0	X	0	1	1	0	06	16
7 UPDATE	B	0	0	0	X	0	1	1	1	07	17
X - Depends on the position of the INT/EXT CONTROL switch.											

The MASTER CLR switch (S2), on the rear-panel is used to clear all interrupt conditions during a restart from the SD410.

4.6.3 External Aborts

External aborts are brought in through the rear-panel on AB1 and AB2 BNC Connectors. The SD410 can be configured using DIP switch U46, to accept either a normally open or a normally closed external switch contact as an abort condition.

Table 4-5 is a list of the possible position of the number 1 and 2 switches on U46.

Table 4-5. U46, Positions 1 and 2

SWITCH 1 - AB1	Open	External Switch Contacts = Open	ABORT 1
	Open	External Switch Contacts = Closed	NO ABORT
	Closed	External Switch Contacts = Open	NO ABORT
	Closed	External Switch Contacts = Closed	ABORT 1
SWITCH 2 - AB2	Open	External Switch Contacts = Open	ABORT 2
	Open	External Switch Contacts = Closed	NO ABORT
	Closed	External Switch Contacts = Open	NO ABORT
	Closed	External Switch Contacts = Closed	ABORT 2

4.6.4 CHAMBER STB, CHAMBER STOP and CHAMBER ALARM

These three functions from the Chamber Controller are also controlled by the DIP switch U46. Table 4-6 is a list of the conditions that can be set by the remainder of U46 DIP switch positions.

Table 4-6. U46, Positions 3 Through 6

SWITCH 3 - CHAMBER STOP	Open	External Switch Contacts = Open	CHAMBER STOP
	Open	External Switch Contacts = Closed	NO CHAMBER STOP
	Closed	External Switch Contacts = Open	NO CHAMBER STOP
	Closed	External Switch Contacts = Closed	CHAMBER STOP
SWITCH 4 - CHAMBER STB	Open	External Switch Contacts = Open	CHAMBER STB
	Open	External Switch Contacts = Closed	NO CHAMBER STB
	Closed	External Switch Contacts = Open	NO CHAMBER STB
	Closed	External Switch Contacts = Closed	CHAMBER STB
SWITCH 5 - CHAMBER ALARM	Open	External Switch Contacts = Open	CHAMBER ALARM
	Open	External Switch Contacts = Closed	NO CHAMBER ALARM
	Closed	External Switch Contacts = Open	NO CHAMBER ALARM
	Closed	External Switch Contacts = Closed	CHAMBER ALARM
SWITCH 6	SPARE		

4.6.5 B MST CLR

B MST CLR is developed by an RC Time Constant circuit during power up. In addition the unit can be Master Cleared at any time by toggling the MASTER CLR switch (S2) on the rear-panel. MASTER CLR is gated with WR2 (RESET CONTROL) to reset both halves of the Interrupt Priority Encoder Register.

4.6.6 Chamber I/F

4.6.6.1 Chamber Control Word Register

The Control Word register is an 8-bit register loaded by a WR6 command (WRITE CHAMBER CONTROL WORD). The 8 bits are loaded from the COD Bus and output through the rear-panel on the Chamber Encoder connector (J4). To read the contents of the Chamber Control Word register a RD18 command (READ CHAMBER CONTROL WORD) is issued. The output of the register is read to the CID BUS. The TEST IN PROGRESS bit is also routed to the rear-panel TEST IN PROGRESS BNC Connector.

4.6.6.2 AUX Lines (1 through 8)

The eight data lines are utilized for remote input of the test number by a Chamber Controller. They duplicate the same functions as the SELECT switch on the front-panel. AUX 1 through AUX 4 provide a BCD input for the units digit (0 through 9). AUX 5 through 8 provide for a BCD input for the tens digit (00 through 90). To read the AUX input lines a RD19 command (READ THERM AUX) is issued. The eight bits are then read directly to the CID BUS.

4.6.6.3 Therm Status Lines

The eight Status lines are read to the CID BUS by a RD20 command (READ STATUS LINES).

4.6.6.4 Interval Counter

The Interval Counter is a parallel loaded UP/DWN counter. It is loaded from the COD BUS by a WR7 command (LOAD INTERVAL COUNTER). MASTER CLR zeros both bytes of the counter. CHAMBER STB input to the counter causes the counter to count up. A RD21 command (READ INTERVAL COUNTER) is issued to read the contents of the Interval Counter to the CID BUS.

4.6.6.5 Unit Status

The Unit Status lines are read to the CID BUS using a RD22 command (READ UNIT STATUS).

4.7 DISPLAY ASSEMBLY (A2A1)

The Display assembly (A2A1) contains the switches, LED indicators, and LED displays located on the front-panel assembly. Figure 4-4 is a block diagram of the display assembly.

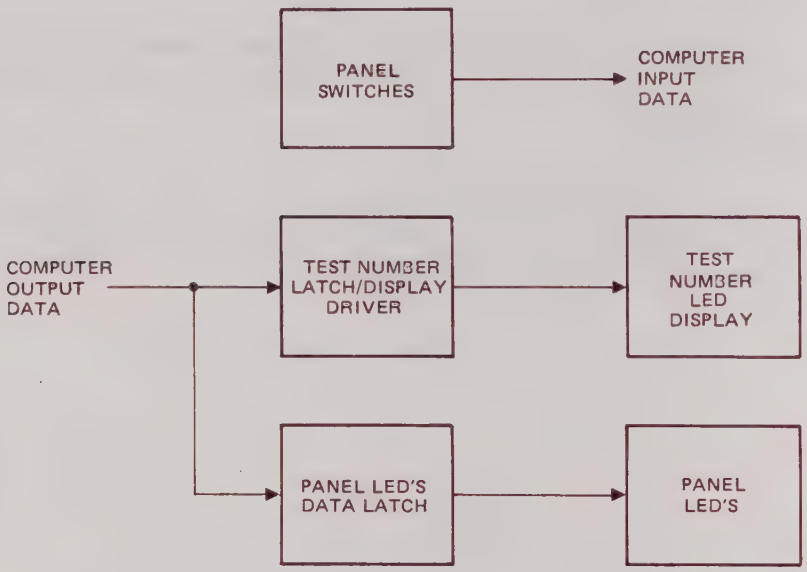


Figure 4-4. Display Assembly, A2A1

4.7.1 Panel LEDS

COD bits 0 through 7 are used to light the front panel LEDS (STOP, START, EQUALIZE, UPDATE, FIXED, ENTER, ACTIVE (R.H.), and ACTIVE (L.H.)). The data bits are latched into a D Flip Flop register by WR1 (WRITE PANEL LEDS).

The COMM FAULT LED is controlled by the COMM FAULT data line which is separate from the register. Also controlled separately from the register are the INT and EXT LED indicators. The CONTROL switch on the rear-panel determines which of these indicators will light, and the mode of the SD410.

To read the position of the front-panel LEDS, the system processor issues a RD17 command (READ PANEL DISPLAY). The contents of the Front-Panel LED register is read to the processor CID Bus.

4.7.2 INT/EXT LEDS

The CONTROL switch is located on the rear panel. It supplies a ground to light the INT or EXT LED indicator on the front panel. In the EXT position, a ground is supplied to the Computer Input Data Bus bit 4 on control board A1A4.

4.7.3 TEST NO Display

COD bits 0 through 7 are latched into a set of LED display drivers by issuing a WRO command (WRITE TEST NO). The output of the drivers is used to display the two digit test number in the TEST NO display. System software recognizes the ENTER pushbutton as the SD410 command to display the test number selected by the TEST NO selector.

4.7.4 Panel Switches

The SELECT switch is a two decade BCD coded switch used to select the test to be run. The contents of the switch are read to the CID BUS by a RD16 command (READ PANEL SELECT SWITCH).

4.7.5 Pushbutton Switches

The six pushbutton switches (STOP, START, EQUALIZE, UPDATE, FIXED AND ENTER) are wired to ground in the normally closed position. Depressing any of the switches causes that line to go high and the appropriate codes to be sent to the System Control unit.

4.8 OPTIONS

4.8.1 (-1 Option) Modem Interface

Addition of the Modem Interface, -1 option to the A1A3 assembly extends the range of the Remote Interface to beyond 750 feet. Figure 4-5 is a block diagram of the Modem Interface. Because of the simplicity of the circuit, an amplified block diagram is included in Figure 4-6.

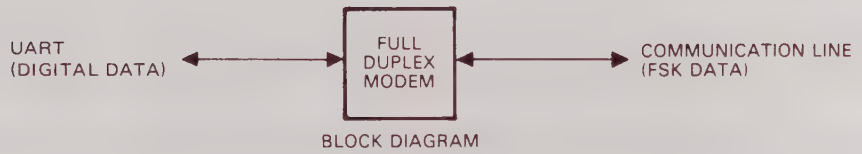


Figure 4-5. Block Diagram, Modem Interface

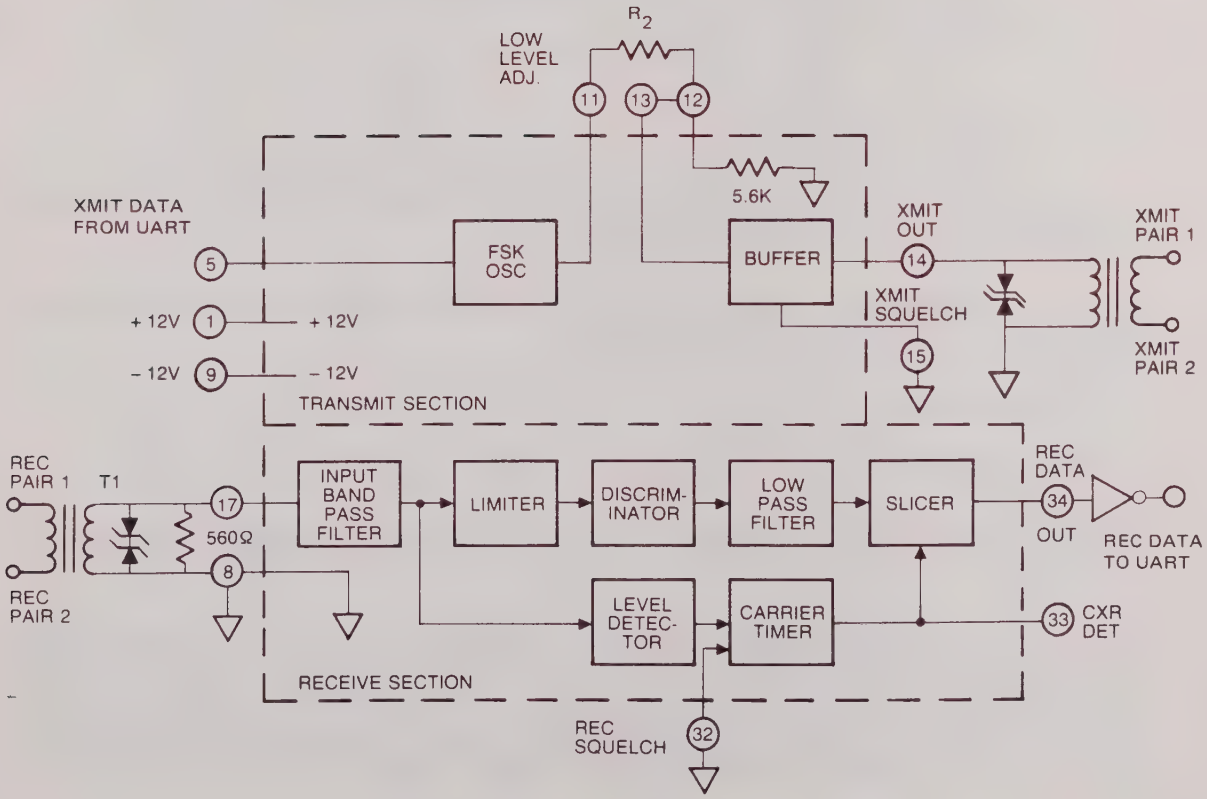


Figure 4-6. Internal Block Diagram

The Modem Interface is divided into two sections:

a. The Transmit section.

b. The Receive section.

TRANSMIT SECTION

The Transmit section consists of a phase coherent FSK (Frequency Shift Keyed) oscillator, an output buffer, and an external level adjust resistor, R3. It outputs a serial, binary, asynchronous, 1200 baud, FSK signal.

A positive signal at pin 5 (XMIT DATA) of the Modem causes the FSK oscillator to generate a MARK (1200 Hz). When the signal is negative at pin 5 a SPACE (22 Hz) is generated.

The level of the signal generated by the Modem is adjusted by the voltage divider network consisting of the internal resistor (5.6K ohms) and R3. The value of R3 can be changed to adjust the output level in accordance with the values in Table 4-7.

Table 4-7. R3 Selection

Value of R3	Transmitter Output Level
3.6K	0 dBM
7.5K	−3 dBM
13.0K	−6 dBM
20.0K	−9 dBM

The output of the Transmit section is then buffered, fed into a 600 ohm coupling transformer at pin 14 (XMIT OUT) and routed to the rear-panel J5 connector.

A ground is supplied to the unused pin 15 (XMIT SQUELCH). The diodes in the transformer circuit limit induced transients to a safe limit for Modem A1.

RECEIVE SECTION

The Receive section consists of a Band Pass Filter, a Demodulator, and a Level Detector.

It accepts a serial, binary, asynchronous, 1200 baud, phase coherent FSK signal and presents it at pin 34 (REC DATA OUT) as +10 Vdc for a SPACE and −10 Vdc for a MARK.

The Low Pass Filter is set to pass the 1200 Hz Mark Frequency. The Level Detector turns on 40 ms after the receipt of in-band energy greater than −40 dBM. The CXR DET goes high (+10 Vdc) and gates REC DATA OUT. Ten ms after the loss of signal CXR DET goes low (−10 Vdc) and turns off the REC DATA OUT. The receiver output is inverted by U7 and multiplexed with the serial receive data and input to the UART on the RSI (RECEIVE SERIAL OUTPUT) pin.

4.8.2 (-2 Option) Chamber Controllers with Negative True Logic

The -2 Option is incorporated into the SD410 by removing A1A4U15 and replacing it with a 74LS240N extended in a socket. A 4.7K ohm resistor package (898-1R-4.7K) is piggybacked to the new U15 to provide pullup resistors for the AUX input lines. A jumper is added to provide the proper input to the 2G gate on the chip. Figure 4-7 is a schematic of the changes made to incoporate the modification.

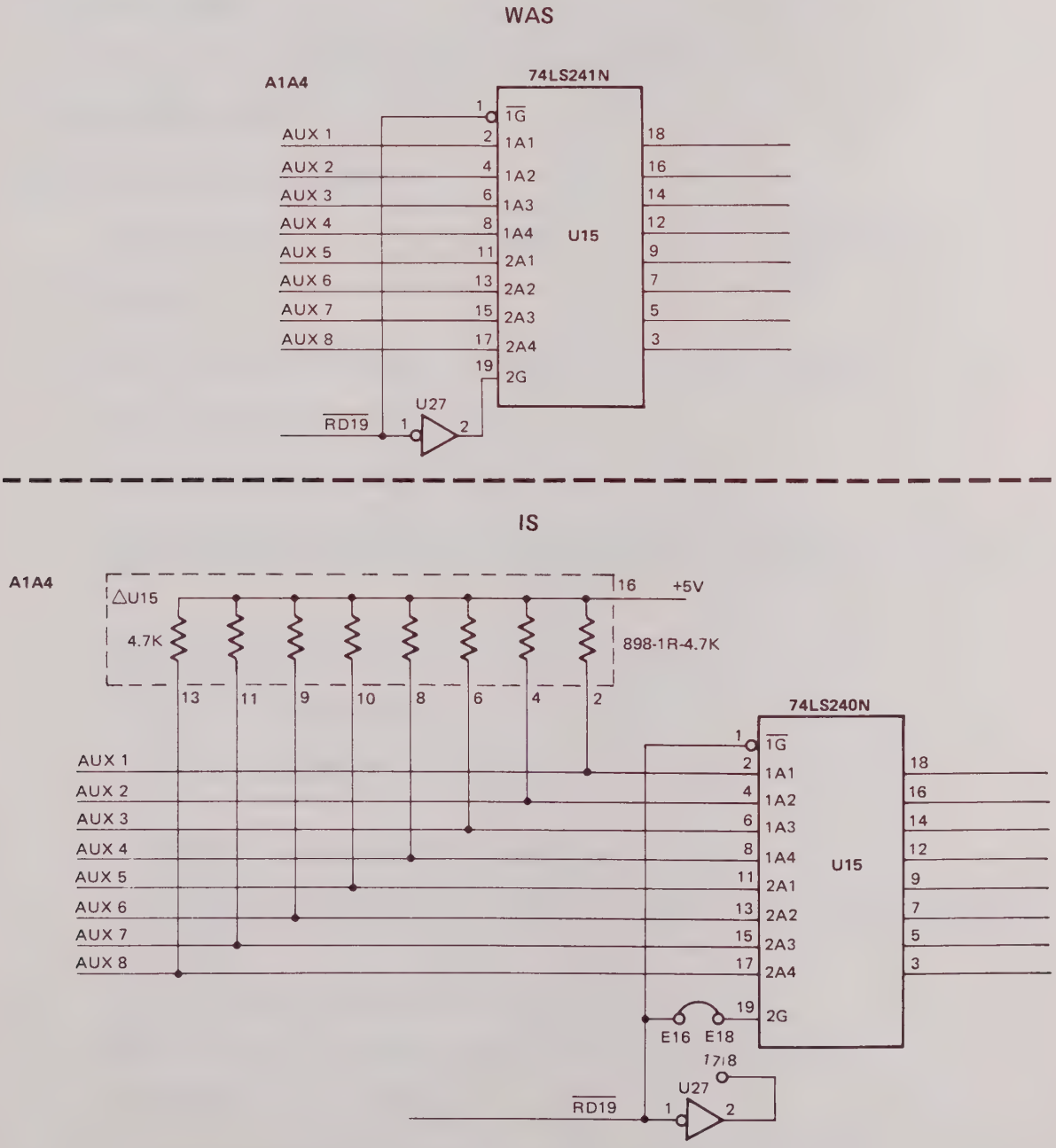


Figure 4-7. -2 Option Schematic

SECTION V

CALIBRATION AND MAINTENANCE

5.1 INTRODUCTION

The only adjustments in the SD410 are made on the power supplies.

5.2 EQUIPMENT CALIBRATION

5.2.1 Suggested Test Equipment

Digital Voltmeter	3400A	Hewlett Packard

5.2.2 Procedure

The following procedure is an explanation of the calibration for the two power supplies in the SD410.

a. Extend the SD410 in the equipment rack.

b. Remove the power connector on the rear panel.

c. Remove the four screws in the top cover. Being careful not to damage any of the cabling harness, slide the cover to the rear to expose the power supplies located at the front of the unit.

d. Disconnect the two power supply connectors from the circuit board assembly.

e. Adjust PS1 (+5 Vdc) as follows:

1. Connect the digital voltmeter "+" to PS1 "+" and the digital voltmeter "−" to PS1 "−".

2. Connect the power connector to the rear panel and apply power.

3. The digital voltmeter should read 5.000 ±0.025 Vdc. Adjust PS1-R10 to obtain this reading.

4. This completes the calibration of the +5 Vdc power supply.

f. Remove the test connections made on the +5 Vdc power supply.

g. Adjust PS2 (±12 Vdc) as follows:

1. Connect the digital voltmeter "+" to PS2 "+ out" and digital voltmeter "−" to PS2 "COM".

2. The digital voltmeter should read +12.000 ± 0.025 Vdc. Adjust PS2-R22 to obtain this reading.

3. Connect the digital voltmeter "−" to power supply "− out".

4. The digital voltmeter should read −12.000 ± 0.025 Vdc. Adjust PS2-R28 to obtain this reading.

5. This completes the calibration of the ±12 Vdc power supply.

h. Disconnect power from the rear panel, remove all test connections, and reconnect the two power supply connectors, disconnected at the beginning of the procedure (step d).

Reseat the top cover and install the four cover screws. Slide the unit back into the equipment rack.

5.3 EQUIPMENT MAINTENANCE

There is no periodic maintenance required on the SD410.

SECTION VI

REPLACEMENT PARTS

6.1 INTRODUCTION

Except for some Scientific-Atlanta specification-controlled parts listed in Table 6-1, which must be ordered from Scientific-Atlanta, Inc., standard electronic parts have been used throughout the instrument. Some miscellaneous standard parts have been included in the tables to aid replacement. Scientific-Atlanta maintains a complete stock of all parts and complete printed circuit cards used in this instrument.

If printed circuit cards with different assembly numbers were provided in different serial numbered instruments, the tables will contain duplicates of some reference designators. The applicability of a particular printed circuit card is indicated by the assembly number (part number) etched on the board.

When ordering a replacement part or assembly, be sure to include the following information:

a. REFERENCE DESIGNATOR, of the part being ordered.

b. PART NUMBER, of the part being ordered.

c. DESCRIPTION, or the part being ordered.

When ordering printed circuit cards the following information should also be included:

a. ASSEMBLY NUMBER, of the circuit card being ordered.

b. SERIAL NUMBER, of the instrument in which the card is installed.

c. Complete MODEL NUMBER (including all "dash" numbers), of the instrument in which the card is installed.

Table 6-1. Special Replaceable Parts List, Printed Circuit Assemblies

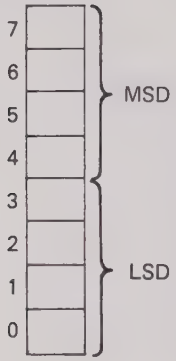
Reference Designator	Description	Part Number
SD410	Complete Assembly	21178100
A1	Main Frame and Chassis Assembly	21179100
A1-A1	Display Assembly	21174800
A1-A2	Front Panel Assembly	21178300
A1-A3	Remote Interface Assembly	21178800
A1-A4	Control Board Assembly	21181500
A2	Rear Panel Assembly	21178400
	Accessory Kit	21178200
F1	Fuse, 1A SLO	
F1	Fuse, 2A SLO	

APPENDIX A

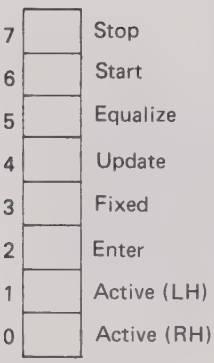
Group Select Code (WRITE)

Decimal	Hex	Function	No. of Bits	Remarks	To Verify Command
0	(0)	Test Number	8	2 BCD Characters	
1	(1)	Panel Display	8	"1" Turns LED On	RD17
2	(2)	Reset Control			
3	(3)	Generate "A" INT			
4	(4)	Number of Xmit Tries	4		
5	(5)	Wrap Around	1		
6	(6)	Chamber Control Word	8		RD18
7	(7)	Load Interval Counter	8		RD21
8	(8)				
9	(9)				
A	(10)				
B	(11)				
C	(12)				
D	(13)				
E	(14)				
F	(15)				
20	(16)	Read Select Switch	8	2 BCD Characters	
21	(17)	Read Panel Display	8		WR1
22	(18)	Read Chamber Control Word			
23	(19)	Read Therm AUX (1-8)	8		
24	(20)	Read Therm Status			
25	(21)	Read Interval Counter			
26	(22)	Read Unit Status			
27	(23)				
28	(24)				
29	(25)				
2A	(26)				
2B	(27)				
2C	(28)				
2D	(29)				
2E	(30)				
2F	(31)				

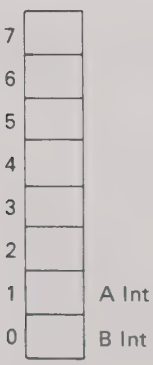
WRITE GROUP COMMAND	DATA FIELD
00	Test Number



01	Panel Display



02	Reset Control



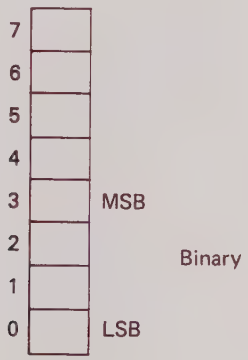
WRITE
GROUP COMMAND
03

DATA FIELD

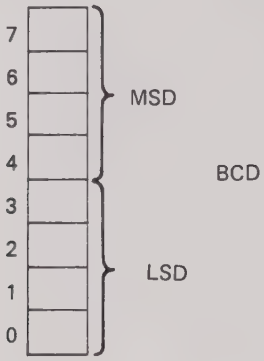
Generate "A" INT

04

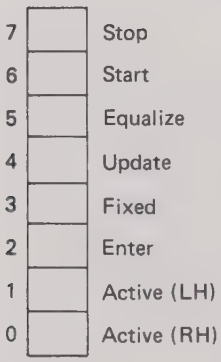
Number of Xmit Tries



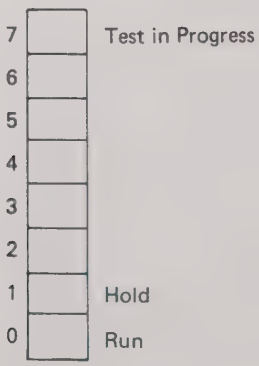
READ GROUP COMMAND		DATA FIELD
16	Read Select Switch	



17	Read Panel Display	

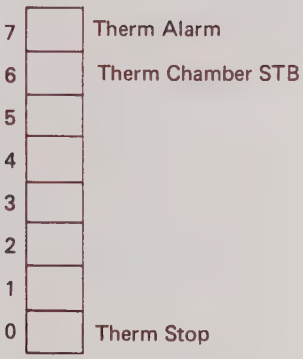


18	Read Chamber Control Word	

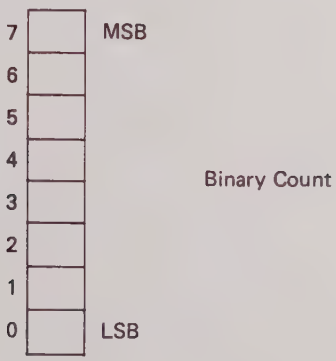


READ GROUP COMMAND		DATA FIELD
19	Read Therm AUX (1-8)	

24	Read Therm Status	



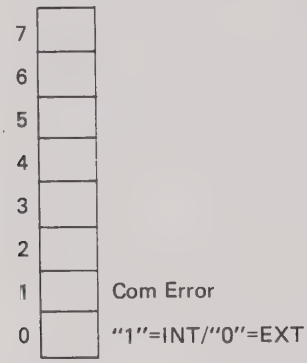
21	Read Interval Counter	



READ
GROUP COMMAND
22

DATA FIELD

Read Unit Status



APPENDIX B

SD410 to THERMOTRON 13024/25 Interface

Signal Name	SD410 Pin Number	THERMOTRON Pin Number (Terminal Strip)
AUX 1	J5-47	31
AUX 2	J5-46	30
AUX 3	J5-45	29
AUX 4	J5-44	28
AUX 5	J5-48	27
AUX 6	J5-99	26
AUX 7	J5-50 to J5-6 (GND)	—
AUX 8	J5-25 to J5-11 (GND)	—
START	J5-26	25 (AUX 7)
STOP	J5-27	24 (AUX 8)
GND	J5-1	33

NOTE: The THERMOTRON 13024/25 uses POSITIVE logic.

A) Use the standard SD410 configuration (A1A4U15 = SN74LS241N).

B) U46 all positions closed.

SD410 to TENNY DIGITRON Interface

Signal Name	SD410 Pin Number	TENNY DIGITRON Pin Number
AUX 1	J5-47	13
AUX 2	J5-46	12
AUX 3	J5-45	11
AUX 4	J5-44	10
AUX 3	J5-48	9
AUX 4	J5-49	—
AUX 5	J5-50	—
AUX 6	J5-25	—
START	J5-26	8 (EV 6)
STOP	J5-27	7 (EV 7)
GND	J5-1	6

NOTE: The TENNY DIGITRON uses NEGATIVE logic.

A) Use an SD410-2 configuration (A1A4U15 = SN74LS240NI.

B) U46 - switch positions 1, 2, 4, and 6 closed.

C) U46 - switch positions 3 and 5 open.

SD410 to HONEYWELL MODEL DCP 77001 Interface

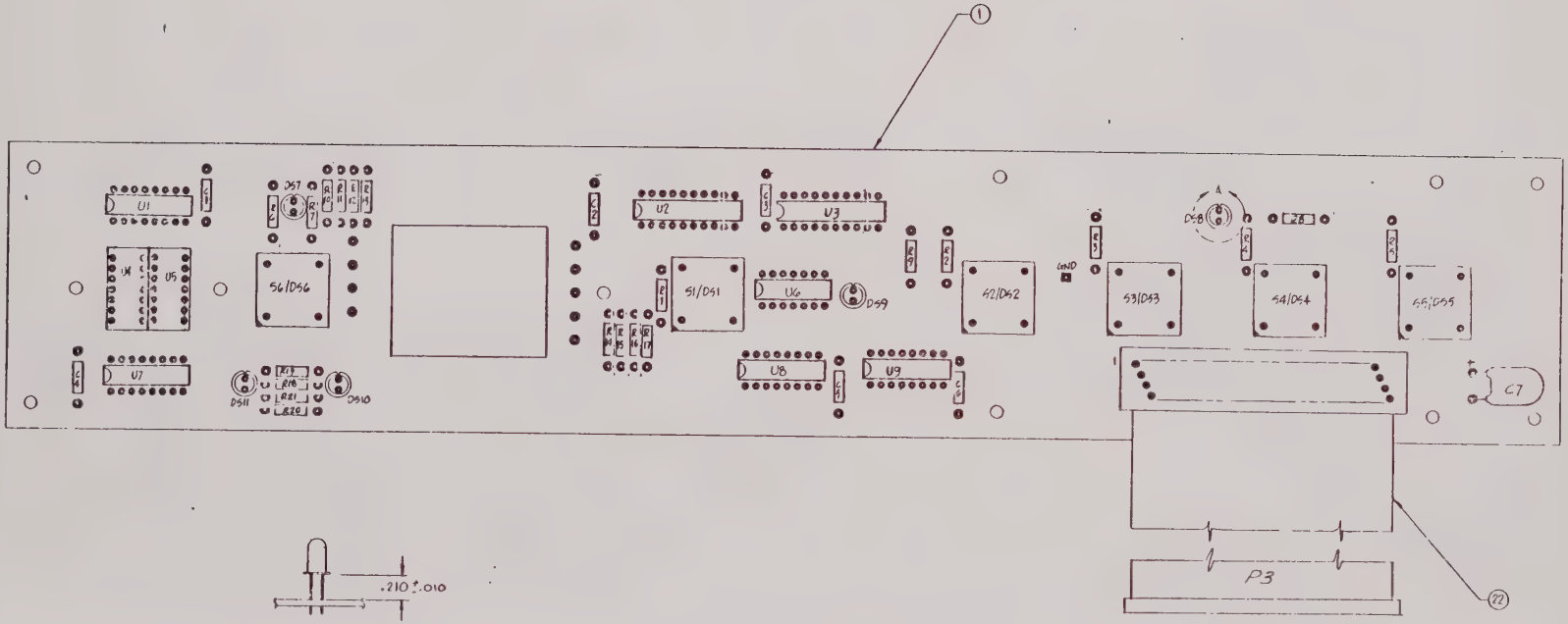
Signal Name	SD410 Pin Number	HONEYWELL Pin Number
AUX 1	J5-47	TB2-J
AUX 2	J5-46	TB2-K
AUX 3	J5-45	TB2-L
AUX 4	J5-44	TB2-M
AUX 5	J5-48	—
AUX 6	J5-49	—
AUX 7	J5-50	—
AUX 8	J5-25	—
START	J5-26	TB2-N (AUX 5)
STOP	J5-27	TB2-P (AUX 6)
GND	J5-1	TB3-GND

NOTE: The HONEYWELL Model DCP 770011 uses NEGATIVE logic.

A) Use an SD410-2 configuration (A1A4U15 = SN74LS241N).

B) U46 - switch positions 1, 2, 4, and 6 closed.

C) U46 - switch positions 3 and 5 open.



.210 ±.010

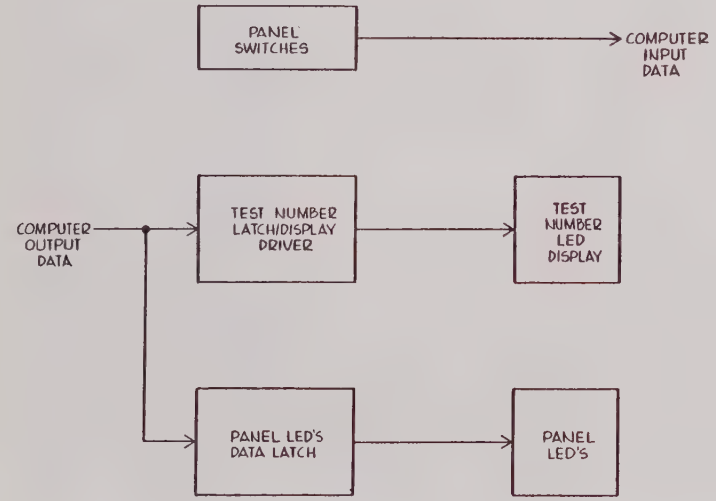
DS7-11 TO BE INSTALLED PERPENDICULAR TO BOARD

DETAIL A

SPECTRAL DYNAMICS CORPORATION	PNA DISPLAY BD	D	30410

21178600

REV	ECO	S/N	DESCRIPTION	DATE	APPD
A	—	—	RELEASED	3-7-74	
B	3627	—	R1-9,20,21 WAS 360Ω	12-6-74	KC
C	4317	-	SEE ECO	6-25-75	CAT



NOTES UNLESS OTHERWISE INDICATED

1. (a) RESISTANCE SHOWN IN OHMS.
   (b) RESISTORS ARE 1/4W, 5%
   (c) CAPACITANCE SHOWN IN MICROFARADS.
   (d) CAPACITORS 50V, +80-20%

INTEGRATED CIRCUITS				
REF DESIG	PART NO	PWR PINS GND	PWR PINS +5V	UNUSED CIRCUITS
U6	SN7404N	7	14	
U8,9	SN74175N	8	16	
U2,3	SN74LS241N	10	20	
U1,7	9368PC	8	16	
U4,5	DL702	12	-	

HIGHEST REF DESIG USED
C7
DS11
R21
U9
S6

PWA 21178500
PWB 21178600

A1

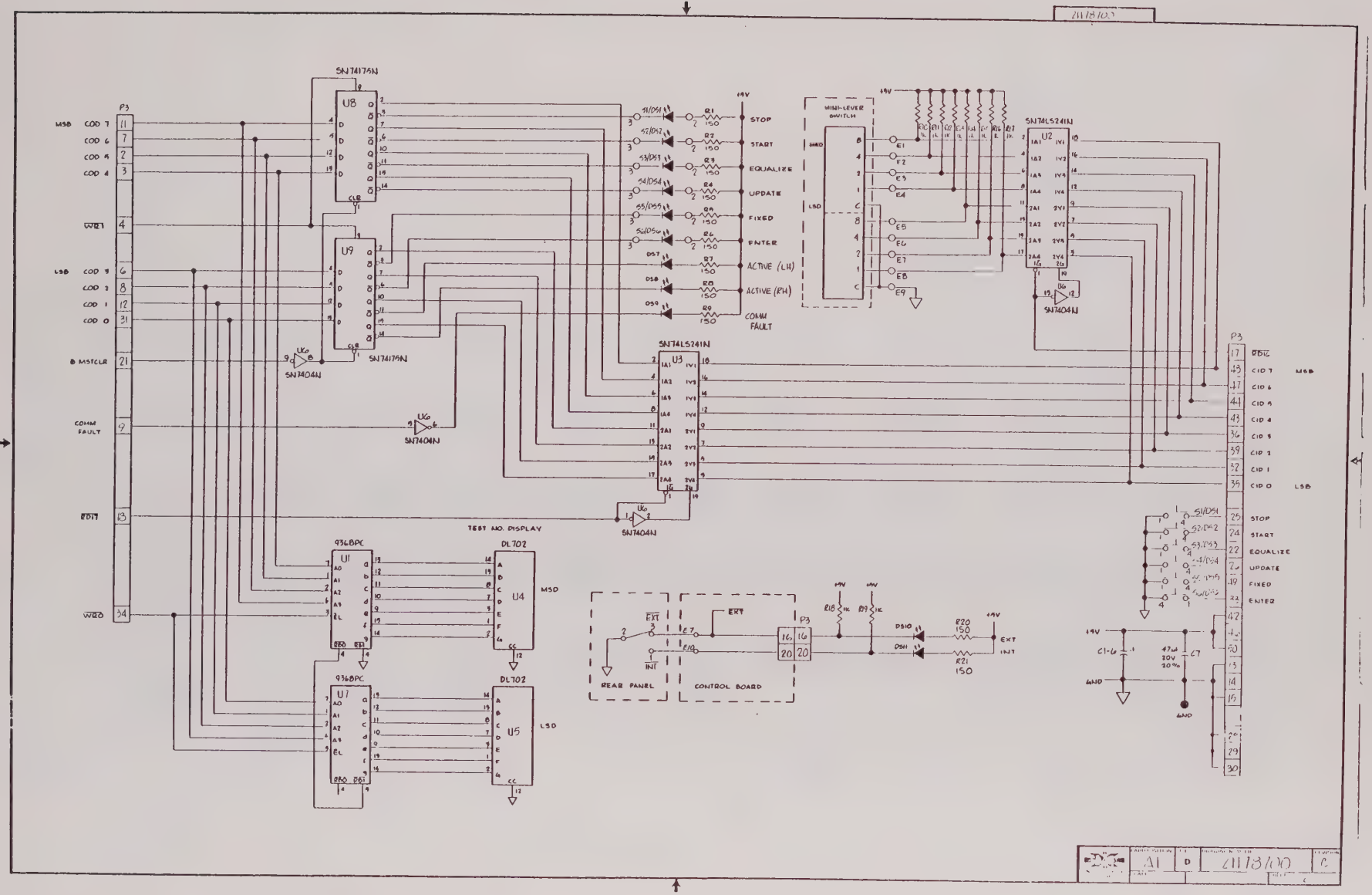
NOTES UNLESS OTHERWISE SPECIFIED

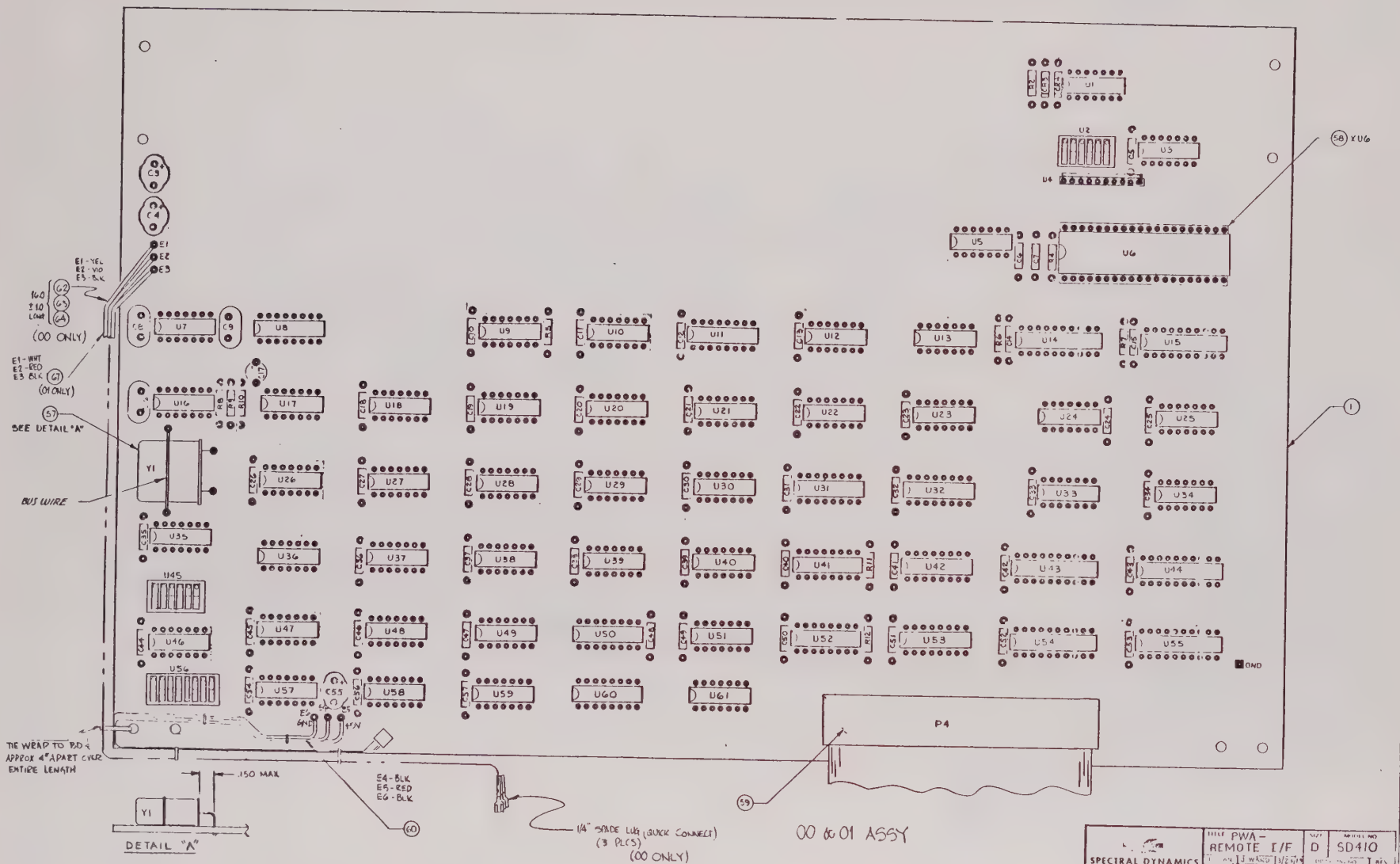
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

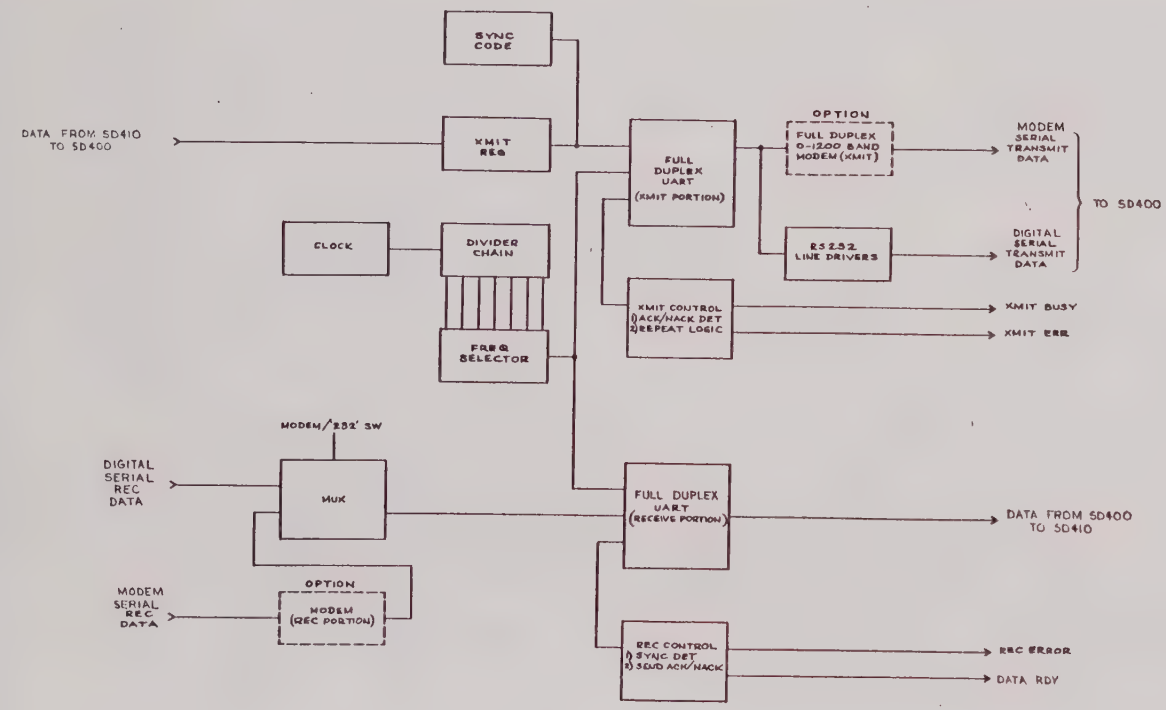
TITLE SCHEMATIC — DISPLAY

MODEL	SIZE	DRAWING NO	REV
4310	D	21179700	C

SCALE NONE SHEET 1 OF 2


SN74175N
SN74LS241N
SN7404N
MINI-LEVER SWITCH
STOP
START
EQUALIZE
UPDATE
FIXED
ENTER
ACTIVE (LH)
ACTIVE (RH)
COMM FAULT
TEST NO. DISPLAY
9368PC
DL702
REAR PANEL
CONTROL BOARD
MSB
LSB
+9V
GND


E1 - YEL
E2 - VIO
E3 - BLK
(00 ONLY)
E1 - WHT
E2 - RED
E3 BLK
(01 ONLY)
SEE DETAIL "A"
BUS WIRE
TIE WRAP TO PCB APPROX 4" APART OVER ENTIRE LENGTH
.150 MAX
DETAIL "A"
E4 - BLK
E5 - RED
E6 - BLK
1/4" SPADE LUG (QUICK CONNECT) (3 PLCS) (00 ONLY)
P4
00 & 01 ASSY
XU6
SPECTRAL DYNAMICS CORPORATION
PWA - REMOTE I/F
D
SD410
21178800
K



REV	ECO	S/N	REVISIONS DESCRIPTION	DATE	CHK'R	APP'D
A	—	—	RELEASED	[illegible]	[illegible]	[illegible]

NOTES: UNLESS OTHERWISE INDICATED:

1. (a) RESISTANCE SHOWN IN OHMS
   (b) RESISTORS ARE 1/4W, 5%
   (c) CAPACITANCE SHOWN IN MICROFARADS
   (d) CAPACITORS @ 1 AM 25V, +80-20%
2. SWITCH SETTING SHOWN FOR 1200 BAND, DIGITAL LINK, USING ODD POLARITY, 8 BIT DATA AND 1 STOP BIT

HIGHEST REF DESIG USED	INTEGRATED CIRCUITS				
	REF DESIG	PART NO	PWR PINS GND	PWR PINS +5V	UNUSED CIRCUITS
A1	U58	[illegible]	7	14	
C57	U[illegible]	[illegible]	7	14	
CR6	U[illegible]	[illegible]	7	14	
P4	U[illegible]	[illegible]	7	14	
R12	U51	[illegible]	7	14	
T2	U7	[illegible]	7	14	
U61	U6	[illegible]	8	16	
Y6	U[illegible]	[illegible]	7	14	
E6	U[illegible]	[illegible]	7	14	
	U1	[illegible]	8	16	
	U12,38	[illegible]	7	14	
	U13,17,28,30	[illegible]	7	14	
	U14,15	[illegible]	10	20	
	U16	[illegible]	7	14	
	U19,21,61	[illegible]	7	14	
	U23,[illegible]	[illegible]	7	14	
	U27,31,32,47	SN74LS73AN	11	4	
	U31,51,52,60	[illegible]	8	16	
	U36	[illegible]	8	16	
	U35	[illegible]	7	14	
	U39	[illegible]	7	14	
	U42,53	[illegible]	8	16	
	U43,44,54,55	SN74LS374N	10	20	
	U48	[illegible]	7	14	
	U50	SN74LS138N	8	16	
	U[illegible]	[illegible]	SEE CHRT		
	U[illegible]	[illegible]	SEE CHRT		
	[illegible]	[illegible]	7	14	

PWA 21178800
PWB 21178900

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES LINEAR .XX = ± .03 .XXX = ± .010 ANGULAR ± 0 30'
DO NOT SCALE DRAWING
MATERIAL —
FINISH —

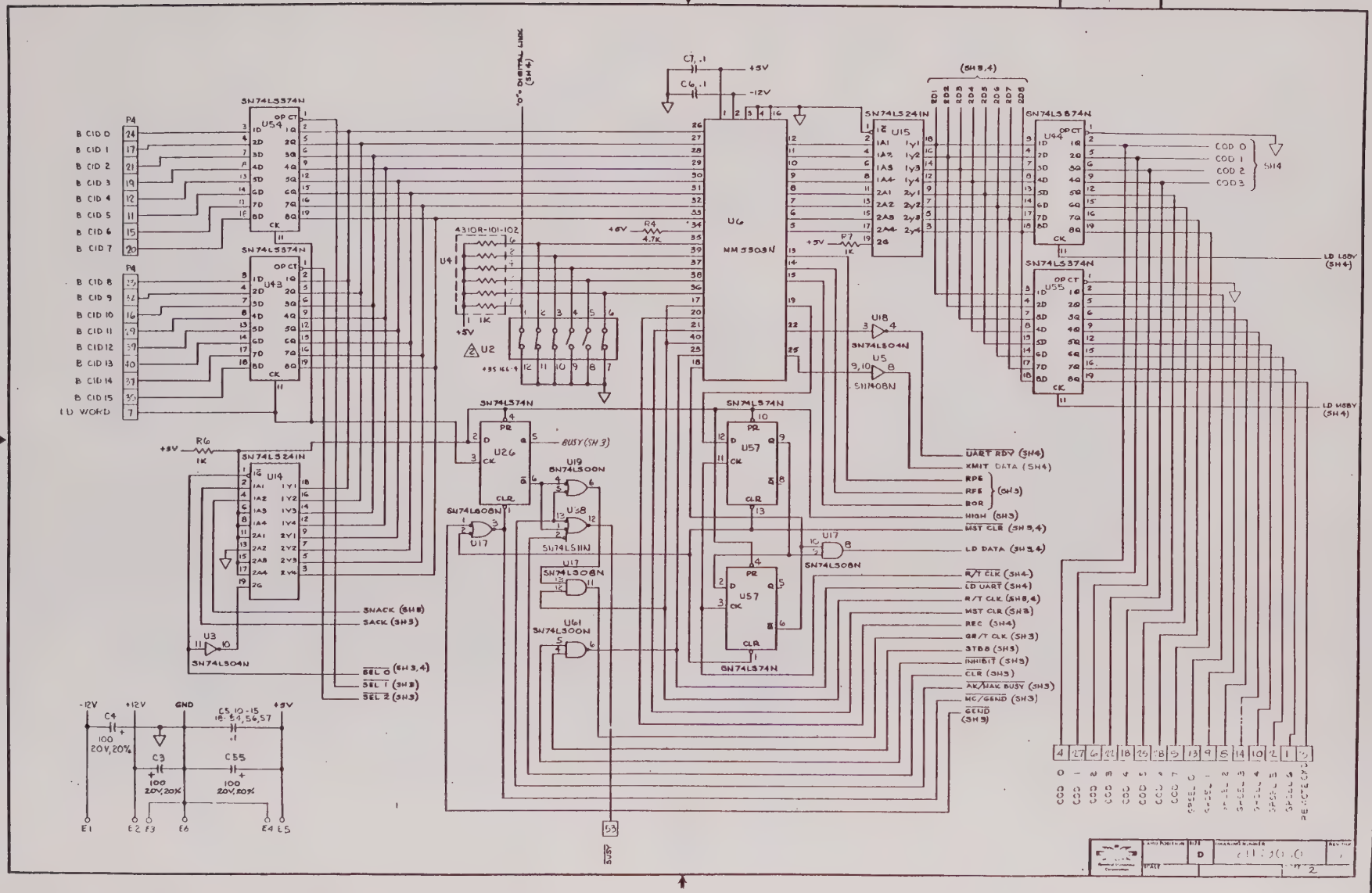
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

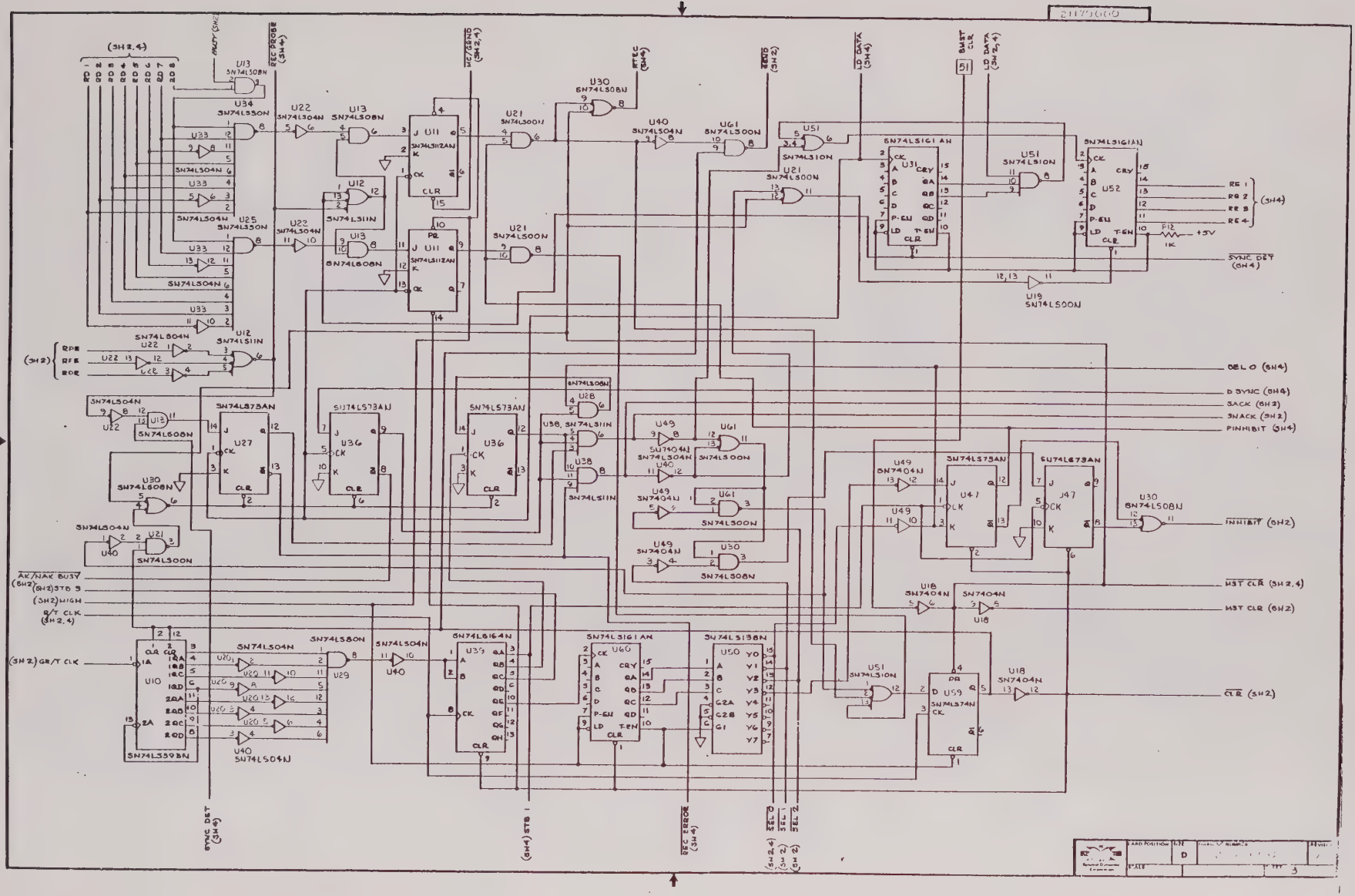
TITLE: SCHEMATIC- REMOTE I/F

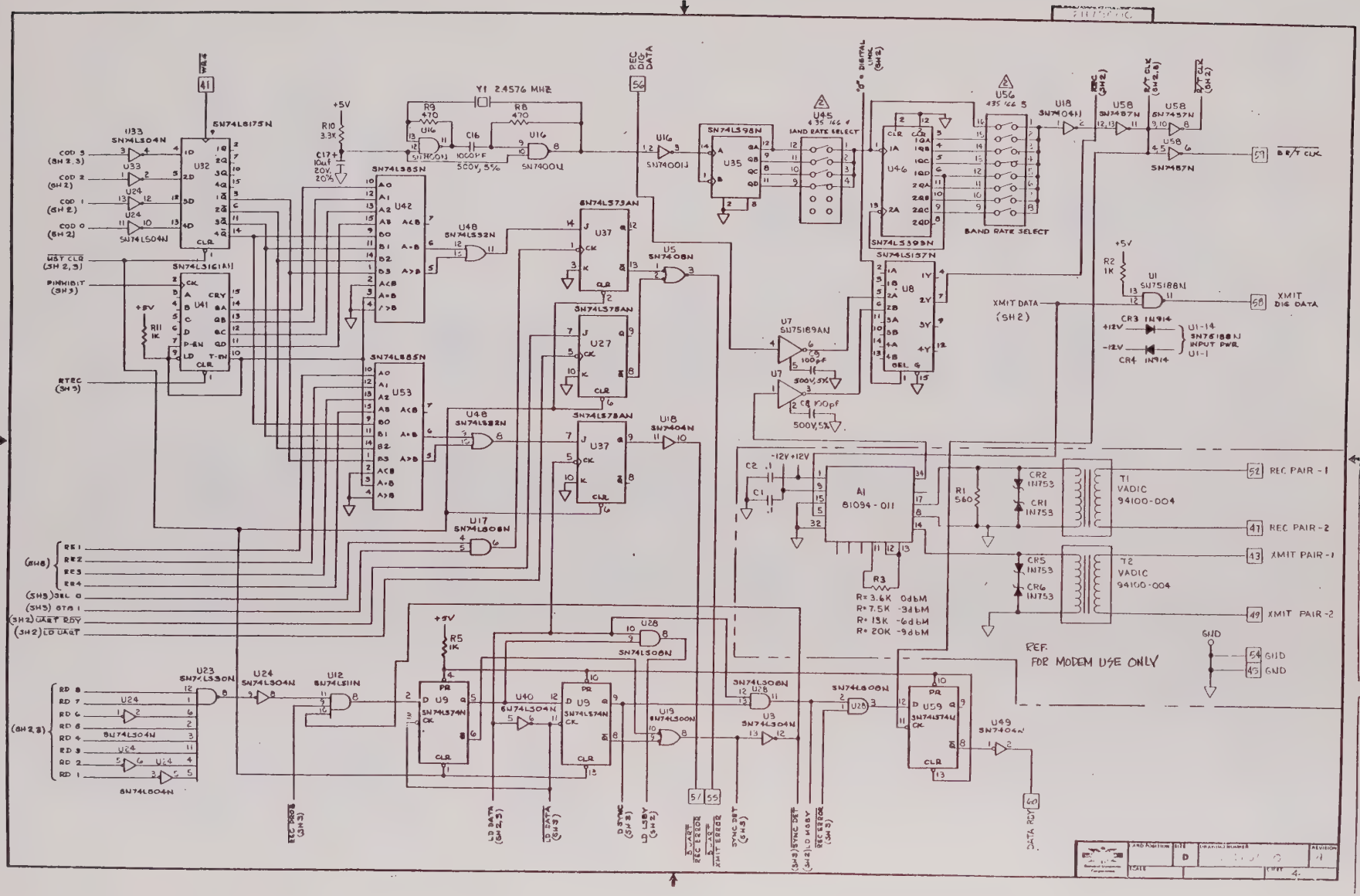
MODEL	SIZE	DRAWING NO.	REV
SD[illegible]	D	21[illegible]	A

SCALE — SHEET 1 OF 4

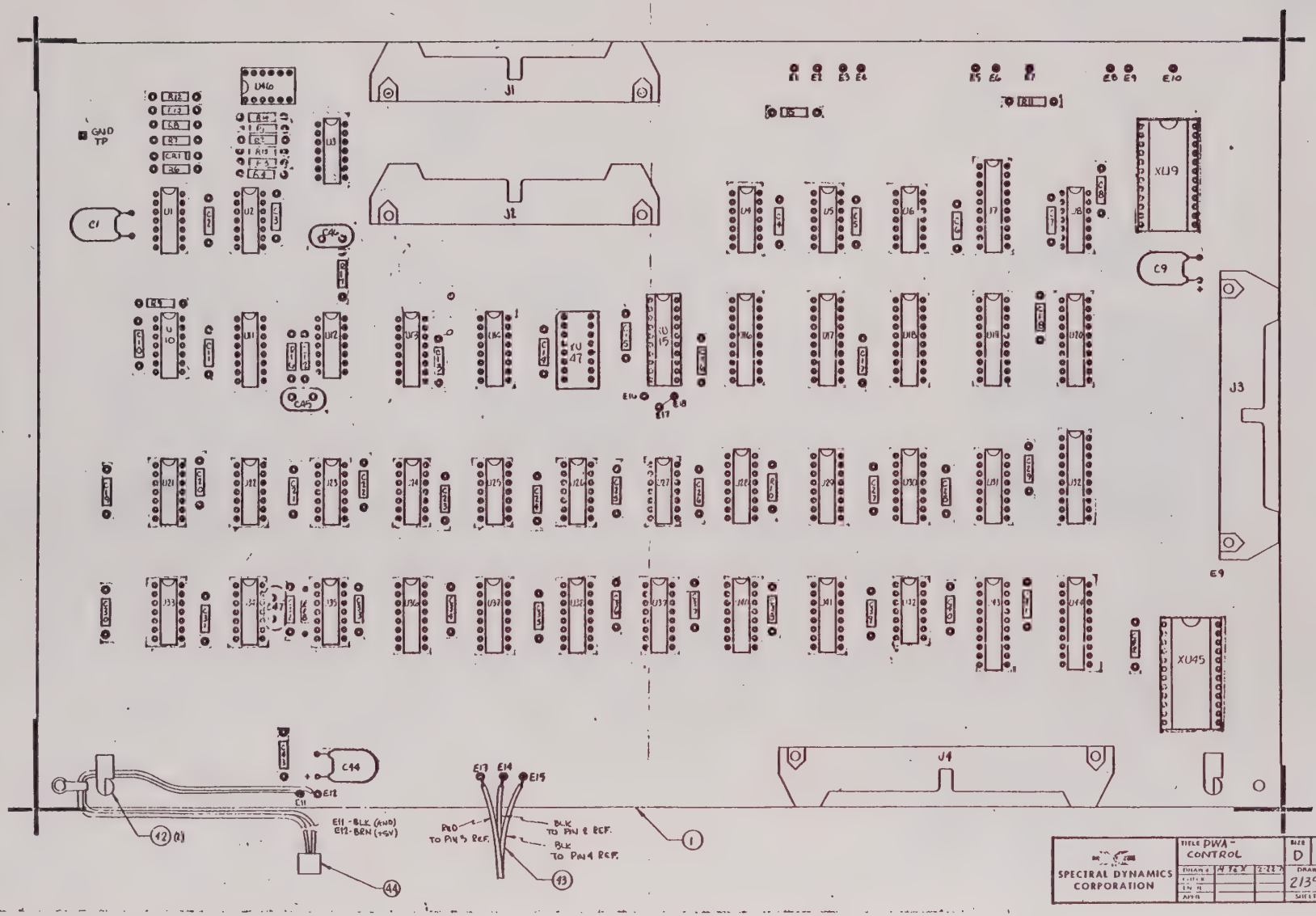
NOTES UNLESS OTHERWISE SPECIFIED


P4
B CID 0
B CID 1
B CID 2
B CID 3
B CID 4
B CID 5
B CID 6
B CID 7
B CID 8
B CID 9
B CID 10
B CID 11
B CID 12
B CID 13
B CID 14
B CID 15
LD WORD
SN74LS374N
U54
U43
U6
MM5309N
U15
SN74LS241N
U44
U55
U4
U2
U14
U26
U57
U18
U5
SN74LS04N
SN74LS08N
U19
SN74LS00N
U38
SN74LS11N
U17
SN74LS30BN
U61
U3
R4
4.7K
R6
1K
R7
1K
C7, .1
C6, .1
+5V
-12V
+8V
GND
C4
100
20V, 20%
C3
C55
C5, 10-15
18-54, 56, 57
E1
E2 E3
E6
E4 E5
10^6 DIGITAL LINK (SH4)
(SH8,4)
COD 0
COD 1
COD 2
COD 3
SH4
LD LSBY (SH4)
LD MSBY (SH4)
UART RDY (SH4)
XMIT DATA (SH4)
RDE
RFE
(SH3)
BOR
HIGH (SH3)
MST CLR (SH3,4)
LD DATA (SH3,4)
R/T CLR (SH4)
LD UART (SH4)
R/T CLK (SH8,4)
MST CLR (SH3)
REC (SH4)
GB/T CLK (SH3)
STB8 (SH3)
INHIBIT (SH3)
CLR (SH3)
AK/NAK BUSY (SH3)
MC/GEND (SH3)
GEND (SH3)
BUSY (SH3)
BUSY
SNACK (SH8)
SACK (SH3)
SEL 0 (SH3,4)
SEL 1 (SH3)
SEL 2 (SH3)
53


(3H2,4)
RD 1
RD 2
RD 3
RD 4
RD 5
RD 6
RD 7
RD 8
U13
SN74LS08N
U34
SN74LS50N
U22
SN74LS04N
U33
SN74LS04N
U25
SN74LS50N
U11
SN74LS112AN
U12
SN74LS11N
U21
SN74LS00N
U30
SN74LS08N
U40
SN74LS04N
U61
SN74LS00N
U51
SN74LS10N
U31
SN74LS161AN
U52
SN74LS161AN
U19
SN74LS00N
U27
SN74LS73AN
U36
SN74LS73AN
U28
SN74LS08N
U38
SN74LS11N
U49
SN7404N
U47
SN74LS73AN
U18
SN7404N
U10
SN74LS39BN
U29
SN74LS80N
U39
SN74LS164N
U60
SN74LS161AN
U50
SN74LS138N
U59
SN74LS74N
R12
1K
+5V
RE 1
RE 2
RE 3
RE 4
(3H4)
SYNC DET (3H4)
DELO (3H4)
D SYNC (3H4)
SACK (3H2)
SNACK (3H2)
INHIBIT (3H2)
MST CLR (3H2,4)
MST CLR (3H2)
CLR (3H2)
AK/NAK BUSY (3H2)
(3H2) STB 9
(3H2) HIGH
R/T CLK (3H2,4)
(3H2) GR/T CLK
SYNC DET (3H4)
(3H4) STB 1
REC ERROR (3H4)
SEL 0
SEL 1
SEL 2
(3H2,4)
(3H2)
(3H2)


Y1 2.4576 MHZ
+5V
WR
REC DIG DATA
XMIT DATA (SH2)
XMIT DIG DATA
BAND RATE SELECT
RTEC (SH3)
RD 8
RD 7
RD 6
RD 5
RD 4
RD 3
RD 2
RD 1
REF. FOR MODEM USE ONLY
REC PAIR - 1
REC PAIR - 2
XMIT PAIR - 1
XMIT PAIR - 2
GND
DATA REF
R= 3.6K 0dBM
R= 7.5K -3dBM
R= 13K -6dBM
R= 20K -9dBM

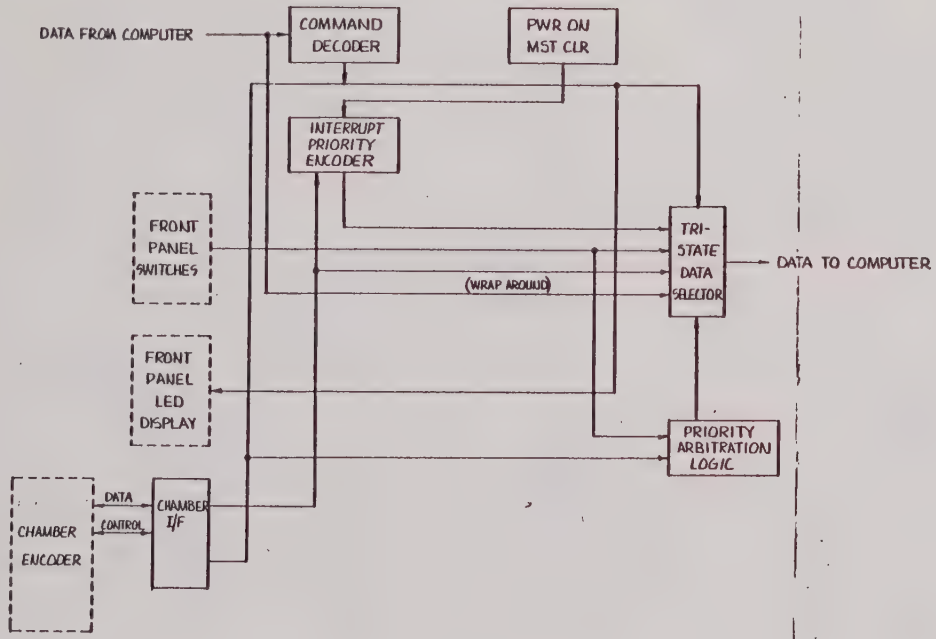
21393200 'E'


GND TP
J1
J2
J3
J4
XU9
XU45
C1
C9
C44
E9
E11 - BLK. (GND)
E12 - BRN (+5V)
RED TO PIN 5 REF.
BLK TO PIN 8 REF.
BLK TO PIN 4 REF.
SPECTRAL DYNAMICS CORPORATION
TITLE PWA - CONTROL
SIZE D
MODEL NO. SD410A
DRAWING NO. 21393200
REV E

21393000 'C'

21393000

REVISIONS						
REV	ECO	S/N	DESCRIPTION	DATE	CHK'D	APP'D
A	—	—	RELEASED	11/20/80	FJS	
B	4517	-	SEE ECO	6-23-81	CAY	
C	4551	-	SEE ECO	7-16-81	K.C.	



NOTES: UNLESS OTHERWISE INDICATED

1. RESISTANCE SHOWN IN OHMS - Ω
2. RESISTORS ARE 1/4W, 5%
3. CAPACITANCE SHOWN IN MICROFARADS
4. CAPACITORS .1 μF, 50V, +80 -20%

INTEGRATED CIRCUITS				
REF DESIG	PART NO	PWR PINS GND	PWR PINS +5V	UNUSED CIRCUITS
U6	SN7400N	7	14	
U10,25	SN74LS20N	7	14	
U8,24,26Z	SN74LS09N	7	14	
U16,23,34	SN74LS08N	7	14	
U33	SN74S11N	7	14	
U7,45	SN7437N	7	14	
U21,22	SN74LS73AN	11	4	
U31	SN74LS74N	7	14	
U3,12	SN74LS86N	7	14	
U1	SN74LS32N	7	14	
U41	SN74LS122N	8	16	
U9,45	SN7415N	12	24	
U28,30	SN74LS175N	8	16	
U29,31	SN74LS95BN	8	16	
U15-20,32,43,44	SN74LS241N	10	20	
U36-39	SN74LS244N	8	16	
U27	SN74LS240N	10	20	
U13,14	SN74LS240N	8	16	
U11,40	RES NET	—	14	

HIGHEST REF. DESIG. USED
A—
C 47
CR1
E 18
L—
Q—
R 45
S 2
T—
TP—
U 46
VR—

PWA- 21393200
PWB- 21393100

A4

NOTES UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES LINEAR .XX = .03 .XXX = .010 ANGULAR = 0 30' DO NOT SCALE DRAWING MATERIAL FINISH

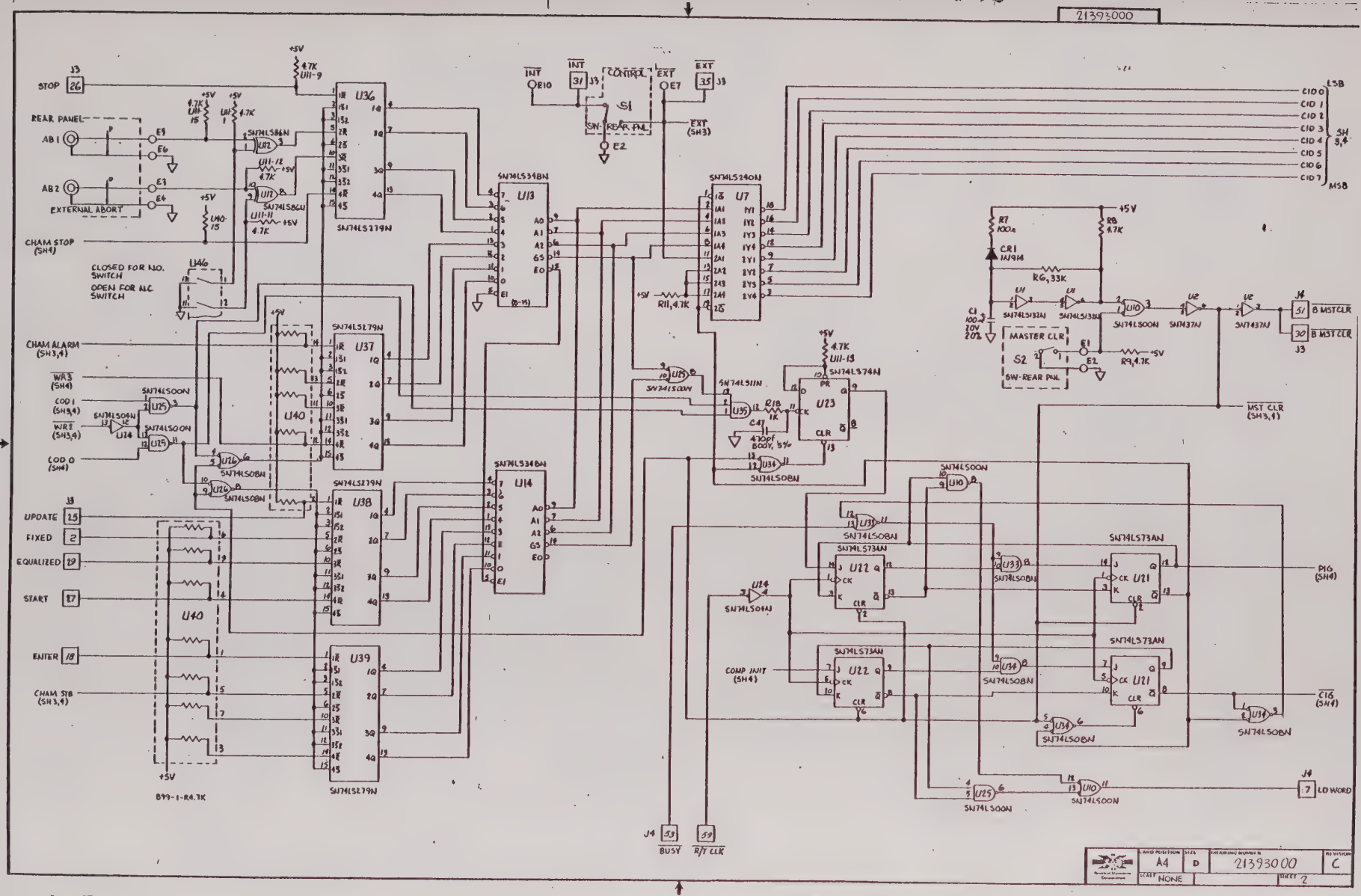
SPECIRAL DYNAMICS CORPORATION OF SAN DIEGO

DRAWN	[illegible]	
IN SIGN'D		
CHECKED	[illegible]	
ENGINEER		
APPROVED		

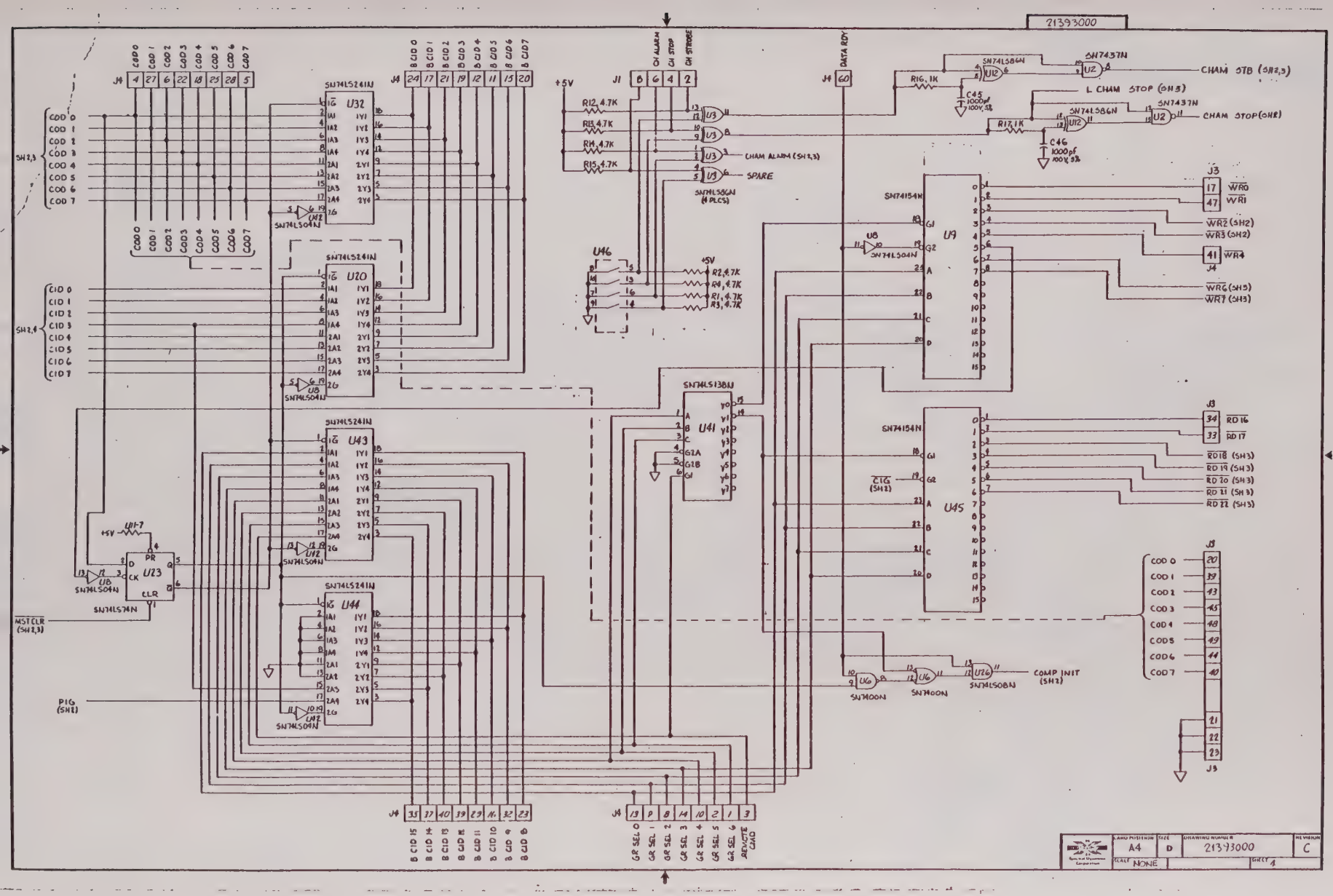
TITLE: SCHEM - CONTROL

MODEL	SIZE	DRAWING NO.	REV
SD410A	D	21393000	C

SCALE NONE | SHEET 1 OF 4

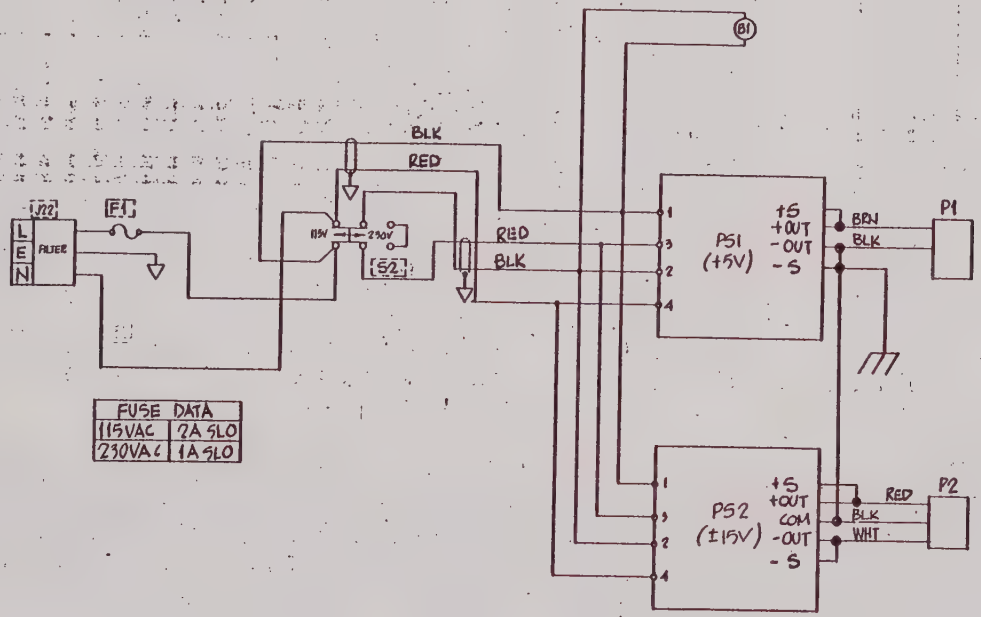

21393000
STOP
REAR PANEL
AB1
AB2
EXTERNAL ABORT
CHAM STOP (SH4)
CLOSED FOR N.O. SWITCH
OPEN FOR N.C. SWITCH
CHAM ALARM (SH3,4)
WR3 (SH4)
COD 1 (SH3,4)
WR2 (SH3,4)
COD 0 (SH4)
UPDATE
FIXED
EQUALIZED
START
ENTER
CHAM STB (SH3,4)
SN74LS279N
SN74LS86N
SN74LS00N
SN74LS08N
SN74LS04N
SN74LS240N
SN74LS373N
SN74LS74N
SN74LS32N
SN74LS37N
MASTER CLR
S1
S2
SW-REAR PNL
CID 0
CID 1
CID 2
CID 3
CID 4
CID 5
CID 6
CID 7
LSB
MSB
B MST CLR
MST CLR (SH3,4)
PIG (SH4)
CIG (SH4)
LO WORD
BUSY
R/T CLR
COMP INIT (SH4)
B99-1-R4.7K
SIZE A4
D
21393000
C
SCALE NONE
SHEET 2

21393000
RUN
HOLD
TEST A/D PROGRESS
REAR PNL TEST IN PROGRESS
COMM FAULT
BURST MSG ERROR
BURST REC ERROR
J1
J3
J4
SN74LS175N
SN7437N PLCC
SN7400N
SN74LS241N
SN74LS04N
SN74LS193N
WR6 (SH4)
MST CLR (SH2,4)
RD 22 (SH4)
EXT (SH2)
RD 18 (SH4)
RD 19 (SH4)
L CHAM STOP (SH 4)
CHAM ALARM (SH,2,4)
RD 20 (SH4)
CHAM STB (SH2,4)
WR7 (SH4)
RD 11 (SH4)
R5, 4.7K
R10 4.7K
C2-8, 10-13 .1uF
C44 100pF, 20V, 20%
C9 100pF 20V 20%
TP GND
GND
+5V
AUX 1
AUX 2
AUX 3
AUX 4
AUX 5
AUX 6
AUX 7
AUX 8
COD 7
COD 6
COD 5
COD 4
COD 3
COD 2
COD 1
COD 0
SH4,2
CID 0
CID 1
CID 2
CID 3
CID 4
CID 5
CID 6
CID 7
SH 2,4
REC PAIR-1
REC PAIR-2
XMIT PAIR-1
XMIT PAIR-2
REC DIG DATA
XMIT DIG DATA
XMIT PAIR-1
XMIT PAIR-2
REC PAIR-1
REC PAIR-2
XMIT DIG DATA
REC DIG DATA
A4
D
21393000
C
NONE
3


21393000
SN74LS241N
SN74LS04N
SN74LS74N
SN74LS138N
SN74154N
SN74LS86N
SN7437N
SN74LS08N
U20
U32
U43
U44
U23
U41
U45
U46
J1
J3
J4
J5
+5V
R12, 4.7K
R13, 4.7K
R14, 4.7K
R15, 4.7K
R16, 1K
R17, 1K
R2, 4.7K
R4, 4.7K
R1, 4.7K
R3, 4.7K
C45 1000pf 100V, 5%
C46 1000pf 100V, 5%
CH ALARM
CH STOP
CH STROBE
DATA RDY
CHAM ALARM (SH2,3)
SPARE
CHAM STB (SH2,3)
L CHAM STOP (SH3)
CHAM STOP (SH3)
COMP INIT (SH2)
MSTCLR (SH2,3)
PIG (SH2)
CTG (SH2)
COD 0
COD 1
COD 2
COD 3
COD 4
COD 5
COD 6
COD 7
B CID 0
B CID 1
B CID 2
B CID 3
B CID 4
B CID 5
B CID 6
B CID 7
CID 0
CID 1
CID 2
CID 3
CID 4
CID 5
CID 6
CID 7
WR0
WR1
WR2 (SH2)
WR3 (SH2)
WR4
WR5 (SH3)
WR7 (SH3)
RD 16
RD 17
RD 18 (SH3)
RD 19 (SH3)
RD 20 (SH3)
RD 21 (SH3)
RD 22 (SH3)
GR SEL 0
GR SEL 1
GR SEL 2
GR SEL 3
GR SEL 4
GR SEL 5
GR SEL 6
REMOTE CMD
A4
D
21393000
C
NONE
SHEET 1

21391400 'B'

21391400						
REVISIONS						
REV	ECO	S N	DESCRIPTION	DATE	APPR	REF
A	—	—	RELEASED	3/5/81	FJS	
B	4763	—	SEE ECO	8/24/82	MRH	



FUSE DATA	
115VAC	2A SLO
230VAC	1A SLO

NOTES: UNLESS OTHERWISE SPECIFIED

1. SYMBOL ⊏⊐ INDICATES REAR PANEL LOCATION.

MAIN FRAME ASSY 21391300

NOTES UNLESS OTHERWISE SPECIFIED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES LINEAR .XX ± .03 .XXX ± .010 ANGULAR ± 0° 30' DO NOT SCALE DRAWING MATERIAL FINISH

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

DRAWN FRANK SILVA 11/9/82
CHECKED
ENGINEER
APPROVED

TITLE: SCHEM - MAIN FRAME

MODEL SD401A | SIZE B | DRAWING NO. 21391400 | REV B

SCALE NONE | SHEET 1 OF 1

Scientific-Atlanta Service Information

Scientific-Atlanta has sales and service centers around the world. In addition, an international network of sales representatives is available to assist you anywhere in the world.

Product Support Programs

Customer Support

At Scientific-Atlanta, we are committed to supporting the instruments we sell. This philosophy is demonstrated through a world-wide sales and service organization which provides a variety of services to our customers.

Service Centers

Scientific-Atlanta maintains a network of service centers around the world. These centers are staffed and equipped to handle most maintenance requirements. In addition, the service center can provide technical assistance on problems related to the application, operation, or maintenance of our products.

- Service representatives are factory trained on each product.
- Specialized knowledge and test equipment is available to provide local repair with minimum downtime.
- The service representatives have the experience to provide on-site calibration and maintenance of individual instruments or entire systems.

To insure continued customer satisfaction, each service center is equipped to provide several types of service:

Warranty Service

Each Scientific-Atlanta manufactured instrument is tested and inspected to conform to its published specifications and to be free of defects in materials and workmanship. Scientific-Atlanta will repair or replace products which prove to be defective within the warranty period. Detailed warranty information is included in the applicable instrument instruction manual. For more information, contact the Scientific-Atlanta office nearest you.

If an instrument develops a defect within the warranty period, contact your Scientific-Atlanta service center. Your Service Representative will help determine the best course of action for effecting the repair of your equipment; all without parts or labor expense to you.

Annual Service Agreement

An annual service agreement is an economical and effective way to assure continued high instrument performance. Periodic scheduled maintenance and calibration is the best insurance against equipment failure. It is a cost-effective means of preventing expensive production interruptions or delays in development programs. You are assured of timely, competent service without the expense of maintaining in-house maintenance capability, specialized test equipment, and replacement parts inventories.

Some of the outstanding advantages of an Annual Service Agreement are:

- Regularly scheduled maintenance and calibration.
- Reduced labor rates — approximately 20% saving over unscheduled field service.
- Quick response on emergency service — normally within 48 hours.
- Facilitates maintenance budgeting.
- Minimizes paperwork — one purchase order covers the entire year.
- On-site service of instruments or entire system — reduces downtime, eliminates problems related to sending individual instruments to the calibration laboratory.

Field Service

Field Service is available to assist you with stubborn maintenance problems, installations, and other technical problems. If field service is required, contact your Scientific-Atlanta service center.

In-House Service

In some cases it is more efficient or cost effective to return equipment to our service center. Your Service Representative will gladly work with you to determine when this is necessary and will provide you with shipping instructions.

Replacement Parts

Each service center maintains inventories of most replacement parts for current standard products. In most cases, emergency orders for parts, printed circuit boards, subassemblies, and supplies can be filled within 24 hours. Ordering parts from Scientific-Atlanta provides you with a single source of supply and assurance of part compatibility.

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